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BRIEFLY TOLD.

PERFECTING THE PUBLICATION OF THE PROCEEDINGS OF THE WESTERN GAS ASSOCIATION.—When the Western Gas Association determined to compile and publish in book form its past proceedings it was known that those who proposed it had undertaken quite a task; but the trouble in store did not deter its officers from going on with the work. If we mistake not the proposer of the plan was Mr. George Treadway Thompson, who, in or out of official harness—and the Association honored him and acknowledged its indebtedness to him by eventually electing him to preside over its deliberations—did much to advance the Association's aims; and in our belief no other thing of greater importance for it did he originate than when he carried to success a vote that the Association's records should be compiled and printed. Shortly after the work of compiling and editing the records was begun, Mr. Thompson, through failing health, was obliged to relinquish in a measure the direct supervision of the editing; but his capable and willing understudies in the work—Mr. James W. Dunbar, Secretary of the Association, and Mr. O. O. Thwing, of St. Louis, whom the Association had named as Editor of the records—in time, and in short time, brought out the first volume of the "Proceedings," which book reported the transactions of the meetings of 1898-97-96. The Association, and wisely it would seem, determined that the publishing should be made in inverse order, that is, that the proceedings of the meetings should be taken up from the current time and carried back as quickly as the funds at command would permit. Those who have read the first volume must admit that the work of its compilers was well done, for within its covers is a complete record of the before-mentioned meetings. It is our further satisfaction to say that Secretary Dunbar and Editor Thwing have had the pleasure of knowing that many copies of the first volume have been disposed of by sale to non-members of the Association. The real gist of the present mention, however, is to call attention to the fact that the editing of the second volume of the "Proceedings" is underway. That edition is to hold the transactions for the years 1895-94-93-92, and Secretary Dunbar desires us to say that any who participated in the discussions on the papers read at the meetings in the years named may have fair chance to correct their speeches. Such corrections are to be mailed to Mr. O. O. Thwing, Editor, care Laclede Gas Company, St. Louis, Mo., before February first, 1900. The files of the JOURNAL are at the command of any who wish to consult them in this connection.

DEATH OF MR. JOHN I. HARTMAN.—"R. B. G.," writing to the JOURNAL, from Lancaster, Pa., under date of the 8th inst., says: "I note your brief reference in to day's issue to the death of Mr. John I. Hartman, who ably and lengthily served the Lancaster Gas Light and Fuel Company as President. Believing that his career is worthier of extended mention than that given by you, I inclose this account thereof, which is fairly accurate—it appeared in most of the Pennsylvania newspapers dated December 28th last: "Mr. John I. Hartman, one of Lancaster's leading citizens, died on the 26th December, after an illness of several months. He was born in Lancaster, in 1831, and was a son of Lewis Hartman and a brother of L. S. Hartman. He learned the printing trade in the *American-Republican* office, and when but

18 years of age engaged in the grocery business on his own account. He served in the Civil War as a Lieutenant in the First (Pa.) Regiment, and later in the 122nd Regiment, eventually going on to the position of Brigade Quartermaster. In 1864 he became a partner with the late Congressman, John A. Heistand, in the publication of the *Examiner*, but after four years, he engaged in the wholesale grocery business with Mr. B. P. Miller, the firm of Miller & Hartman being the pioneers in that business in Lancaster, and they were very successful. They retired in 1890, turning the business over to their sons. Mr. Hartman was a Republican and served one term as a Jury Commissioner. He was a school Director for 30 years, and was an advocate of economy and reform, always opposing the introduction of politics into school matters. In the volunteer fire department days he was President of the Washington Engine Company for many years. He was an organizer of the Lancaster Trust Company, one of the most successful banking institutions in the State, and was its President at the time of his death. He was one of the founders of the Lancaster Watch Company, and was President of the Lancaster Gas Light and Fuel Company, of the Lancaster Edison Electric Light Company and of the Lancaster Cemetery. He was a prominent member of the St. John's Episcopal Church. In his death Lancaster loses a citizen whose memory will be cherished whilst one lives that knew him."

NOTES.—A correspondent in Columbus, Ohio, forwards the following, which has to deal with the supply of artifical gas in Tiffin, Ohio, as carried on by the Kerlin Bros. This mention has further interest from the fact that the Kerlins have purchased the natural gas plant formerly operated on municipal account in Toledo, Ohio, at which point they also propose to furnish artificial fuel gas: "The first effect of the product of Kerlin Bros. new artificial fuel gas plant came to hand in Tiffin the first inst. Fuel gas was used from December 15, 1899, and the bills for cooking stoves, as per the Kerlin supply, range from $3 to $9 for two weeks. Patrons say they cannot afford such charges and are ordering their stoves disconnected. The rate charged is 50 cents per 1,000 cubic feet."——Mr. George W. Graves, of Rochester, N. Y., informs us that he has engaged himself with the Messrs. Abendroth Bros., of this city, who manufacture the York line of gas ranges, etc.——Alderman Thos. F. Ryan, Superintendent of the plant of the Northwestern Gas Light and Coke Company, of Evanston, Ills., died at his home in that city the night of the 2nd inst. The correspondent who forwards this sad news adds: "Mr. Ryan had lived in Evanston 12 years, coming here in 1887 when the Northwestern Gas-Light and Coke Company put in its water gas plant, the construction of which he superintended. Mr. Ryan was born in Hamilton County, near Cincinnati, Ohio, in August, 1858, and his knowledge of the gas business was gained in Chicago. He is survived by a widow and two sons."——At a meeting of the New York Gas and Electric Light, Heat and Power Company, held last week, the following officers were chosen: Directors, A. N. Brady, N. F. Brady, W. E. Dwight, H. E. Gawtry, W. G. Bogert, and R. G. Ballentine. President, A. N, Brady; Vice-President, N, F. Brady; Secretary, L. B. Gawtry. This naming seems sufficiently significant to merit the declaration that the gas and electric lighting of New York City will shortly work in "some sort of harmony." Mr. H. E. Gawtry is President of the Consolidated Gas Company, and Mr. L. B. Gawtry is his son.——A serious explosion occurred in the works of the Essex and Hudson Gas Company, of Newark, N. J., the evening of the 11th inst. As near as we can make it out, for the affair seems most mysterious, the explosion occured in the condensing and scrubbing plant, near by to which was a station meter. The accounts of the disaster are badly mixed, but it seems perfectly safe at this time of writing to assert that it may not be in any sense attributed to defective methods of operation in the purifying house. The damage wrought was considerable, probably amounting to $15,000.——Under the operation of its agreement with the city, the Memphis Gas Light Company has announced that the gas rate for 1900 is to be $1.45 per 1,000 cubic feet. The agreement stipulates that the Company, commencing with the operation of the agreement in 1899, should charge an initial price of $1.50 per 1,000 cubic feet, and that with each 10,000,000 cubic feet increase per annum a reduction of 5 cents per 1,000 is to be made. In 1898 the consumption, as per the returns, amounted to 100,000,000 cubic feet; in 1899 it amounted to 113,000,000 cubic feet—hence the concession.——Mr. J. B. Cocke, the wideawake manager of the Athens (Ga.) Company, reports that gas is in good demand there. The gain in sendout for 1898 over 1897 was considered phenomenal, but the gain for 1899 over its predecessor puts the showing for 1898 completely in the dark.

An Interesting Account of Changed Pressure Conditions in the Gas Supply of Clinton, Iowa.

[By Mr. S. M. HIGHLANDS, Pres. and Supt. Clinton Gas Light and Coke Company.]

While we, on the Mississippi River, are proverbially slow and conservative, yet a few of the things we do out here may interest the fraternity, especially during the long winter evenings after the holiday rush and push is over.

We, this summer, reduced the price of gas in this city to $1 per 1,000 feet, net, for all purposes where an excess of 2,000 feet of gas per month was used. As a consequence business with us has been fairly good, we having set this summer 302 new meters, 200 gas stoves, and hung 700 chandeliers with 1,756 gas burners or tips. All this gave us a new, but not altogether unexpected, source of worry, as we tried to convince ourselves that our mains were large enough to carry all this new business without serious difficulty.

We have, coming from our works, two 6 inch and one 10 inch gas mains, and they looked big enough, but we were mistaken; for, fortunately, or unfortunately, our gas stove customers persisted in staying on during the winter (this for the first time), and when the long evenings set in, and it began getting dark before supper was over (this is in the west, you remember, where we eat supper at six o'clock) we had a great many complaints of poor gas service, and a little investigation on our part showed us that the poor gas service was caused by poor pressure. Do you remember George Livesey's prediction that one day our stoves would lap over our illuminating consumption?

The pressure, as given by our holder, is 29/10. Our pressure gauge at the office, which is 2,000 feet from the works, and in the center of the business district, gave us, on November 20th, the following readings:

4.00	P.M.,	27/10	7.00	P.M.,	19/10
4.30	"	27/10	7.30	"	19/10
5 00	"	20/10	8.00	"	19/10
5.30	"	18/10	8.30	"	21/10
6.00	"	16/10	9.00	"	23/20
6.30	"	19/10			

To remedy this we put in an exhauster built on the principle of the fan or blower. This was set at the works, and was cut into all of our mains leading from our main holder. For safety it was set with a bye-pass, and was started the 28th of November. On December 16th, with the exhauster running, the same pressure gauge at our office gave us the following readings:

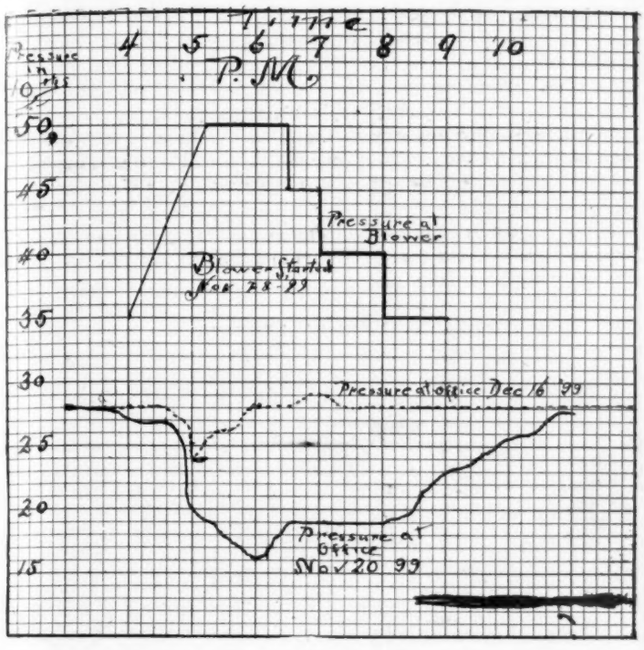
4.00	P.M.,	28/10	7.00	P.M.,	28/10
4.30	"	28/10	7.30	"	27/10
5.00	"	24/10	8.00	"	27/10
5.30	"	26/10	8.30	"	27/10
6.00	"	27/10	9.00	"	27/10
6.30	"	27/10			

At the same time the pressure gauge at the exhauster gave us the following readings:

4.00	P.M.,	29/10	7.00	P.M.,	45/10
4 30	"	40/10	7.30	"	40/10
5 00	"	47/10	8.00	"	40/10
5.30	"	50/10	8.30	"	35/10
6.00	"	50/10	9.00	"	35/10
6.30	"	50/10			

The enclosed diagrams will illustrate the work without and with the exhauster better than the mere statement of the figures.

The exhauster has now been running three weeks, so that we feel slightly at liberty to state what its results have been. In the first place, as you will probably guess, the increase in our output was a very material one, being about 16 per cent. for the 24 hours. Next, the pressure, as shown by the glass gauge, is absolutely steady. Again, our customers are universally asking us what we have done to the gas to make it so good. One of our very largest customers, being a department store, with probably 150 Welsbach burners in use, is located within 500 feet of the works, where the pressure is the highest, finds that the increased pressure does not break its Welsbach mantles to any noticeable extent, and that the service is not only perfectly satisfactory but very much better than it was before. Again, we have one of our largest hotels on our line of main between the works and the office, where the pressure will probably be from three to five tenths higher than it is at the office. The proprietor of the hotel was in the office within the last few days and stated that he never did have his hotel so well lighted as now, and did not think it was possible to light it so well with



gas as is now done; and it is a fact that where our pressure is the highest is the place where the Welsbach light shows the best, making the entire mantle a solid, white luminous cone.

We do not think we have discovered anything new, and know the idea is not, but believe this is the first instance (at least the first we know of) where steps have been taken to raise the pressure on the entire distributing mains to a point at least as high as we have gone.

In New York, Boston, and other cities we know of, high pressure mains are being used for the purpose of equalizing the pressure, but we here have raised it on our entire system, and must say that the customers who are having the highest pressure are the ones who insist they are the best served; and, not only that, but would state that this system has entirely relieved us of the necessity of laying a lot of large distributing mains next summer.

We will be glad to furnish any information on the matter to any parties who may feel interested.

[From *Engineering*.—Continued from page 45.]

American Competition.—No. XV.[1]

The very interesting series of articles on this subject have dealt with it from a general, rather than a detailed, point of view; and it has occurred to me that by placing in order a few notes recently made during a visit to one of the most famous engine building works in the world—those of the E P. Allis Company, of Milwaukee—I might contribute a useful commentary on the generalizations which have taught us the principal reasons of successful American competition. I have not attempted to investigate the cost of production, but only some of the main features of organization, and the result it has produced.

The natural interest taken in the E. P. Allis Company, owing to the fact that one-half the contract for the Glasgow electric tramway engines was recently awarded to them, will render the following notes of special interest, and suited to form a part of the present series. It is a pity some proprietors or managers of our prominent engine works cannot visit a few of these big establishments in the United States. It is not a question whether the American works are better, or worse, than our own; but where problems have been worked out so far apart as those of shop practice in Great Britain and the United States respectively, there must necessarily be something for both sides to learn. The American, more shrewd, and, we are constrained to say, less self satisfied than the Briton, has fully recognized this fact; and there is hardly the head of any important engineering works in the United States who has not taken the trouble to personally acquaint himself with what is being done in England and on the Continent of Europe. On the other hand, comparatively few of our own works' managers have devoted time and expense to visiting works in America, the country above all others which is the home of boldness and ingenuity, controlled by good practical common sense, in all things mechanical. Until the excitement arose over the Glasgow order, I doubt if a large number of British engineers were even acquainted with the name of the successful Milwaukee firm; and of those who had a general notion that such an establishment existed, probably not one in fifty were informed upon the importance and magnitude of its operations.

The standard business of the Edward P. Allis Company is the manufacture of the type of Corliss engine which has been perfected by Mr. Reynolds, the manager of the works, and is generally known in the United States as the Reynolds Corliss engine. The works were started in the year 1860 on a modest scale by the late E. P. Allis, in whose family the property remains, his two sons being now actively engaged in the conduct of affairs. The original business was the construction of flour milling machinery, the modern roller system being, we believe, introduced into America by E. P. Allis, presumably from the Continent of Europe. This special line of business was followed until the year 1877, when a notable departure was inaugurated by the arrival of Mr. Reynolds, who was skilled in steam engine design, more especially in engines of the Corliss type. The chief part of the existing business is, therefore, practically the growth of 22 years, although a good deal of milling machinery is still made and sold. The most notable increase has taken place quite recently, the volume of business done now being practically double what it was three years ago. At the present time, the average output is an engine a day, the smallest being of 30-horse power, although there are very few of this insignificant size. This great increase in recent business has been due mainly to the development of electric traction, the firm having supplied a large number of big engines for this purpose. For instance, the West End Street Railway Company, of Boston, Mass., have taken no less than 16 sets of engines from Messrs. Allis. Seven of these were delivered in one year. They were cross-compound engines, direct coupled, and two had cylinders 32 inches and 64 inches in diameter by 60 inches stroke; three had 28 inches and 56 inches cylinders by 60 inches stroke; and two more, 26 inches and 50 inches cylinders by 48 inches stroke. The other nine sets afterwards supplied to the same Company were triple expansion engines, all, excepting one set, having cylinders 23 inches, 36 inches and 52 inches in diameter by 52 inches stroke. The other engine had 16 inches, 25 inches and 36 inches cylinders by 48 inches stroke. It will be seen that these 16 engines were of no mean size, and constituted in themselves quite a large output. Other traction companies have also given orders of respectable magnitude. For instance, the Brooklyn Heights Company in one year had a round dozen of compound engines, most of them of the size of the largest above named. Six similar type engines have been ordered to be sent to this country for the Central London Railway. About the same time the Government Tramways of Sydney, New South Wales, took some of these big engines; five were required for Spain, six for Dublin, three for Buenos Ayres, three for Middlesbrough, and three more for Sheffield. All these, it will be understood, are for electric traction only, and they by no means exhaust the list of foreign orders. If to the foregoing we add American orders, we have a total of about 300 of these large engines for electric traction purposes alone, and the data we quote from are by no means up to-date, the famous Glasgow engines, for instance, not being included. Of course, these engines have all been built within the last nine years or so, since electric traction came to the fore.

In pumping engines much heavy work has also been executed by the Milwaukee firm. A notable example was a steam pump that had a capacity of 500,000,000 gallons per day of 24 hours. The head, however, was only 4 feet, the pump being of the screw type. The duty was to flush a tunnel and create a flow towards Lake Michigan, and prevent stagnation. It was, perhaps, not a great triumph for the firm to secure this contract, as it was at their own doors; so were five other large pumping plants they supplied for Milwaukee. They have, however, gone far enough afield in the 120 large pumping engines which we find on the list of executed work; South Africa, Mexico and other distant parts being included. In some cases, heads of 1,500 feet to 1,800 feet are pumped against. Engines for mining purposes are also sent to distant lands; quite a number having gone to Johannesburg, and others to South America, Mexico, Australia, etc. Rolling mill engines add 63 sets to the total, and these appear mostly to have been supplied within the last nine years. They are, of course, all powerful engines, and have been for use in the United States, except one set shipped to Russia. Blowing engines supply another large addition to the total of work turned out by this firm during recent year, there being over 100 in all. Perhaps the most remarkable point in this connection is the long list of blowing engines supplied to the Carnegie Steel Company. Of these there are 31 in all, of large size, ranging from 40 inches and 78 inches

1. At the author's request his name is withheld.

by 60 inches steam cylinders, up to 46 inches and 88 inches by 60 inches for compound engines, and 40 inches by 60 inches for single cylinder engines. If to these blowing engines we add six rolling mill engines, to say nothing of other machinery, we think it possible we have a record of the largest transaction in steam engines supplied by one single firm to another firm for the use of the latter. This, of course, would put out of the question transactions between manufacturers and dealers, although in that case we doubt if the magnitude of a similar business has often, if ever, been exceeded.

It would be tedious to enumerate in detail other outlets for their engines which this enterprising firm have discovered. A large number of air compressing engines have been made, whilst foundries, engineering shops, makers of agricultural machinery, saw mills, wagon manufacturers, cotton and woollen mills, sugar and oil works, paper mills, breweries, printers and numberless other industries, have taken engines from the Allis Works. At the time of our visit the firm had on their order book 34 blowing engines, weighing from 400 to 650 tons each. One set is for England, one for South Russia and five for Nova Scotia, where one of the most complete iron works in the world is now being constructed. One set has just been shipped to France. The Nova Scotian engines are of the vertical, cross compound variety, and have two air cylinders of 100 inches each, and steam cylinders 50 inches and 96 inches in diameter by 60 inches stroke. They will blow continuously 40,000 cubic feet of air at atmospheric pressure per minute, against 25 pounds pressure. These are as large as any engines they have yet made of the kind, although similar ones have been supplied to the Carnegie Company; and are not, by the by, included in the above list of blowing engines furnished to the great Pittsburg steel firm. The horse power of these big blowing engines is about 5,000.

Through the courtesy of Messrs. Allis I was enabled to go through their extensive works; and I was naturally curious to find out, if possible, how it was that an establishment with no unusual natural advantages, and situated about 1,000 miles from an ocean port, could successfully compete with other engine builders in all quarters of the globe. My quest was to some extent destined to end in disappointment; at any rate, I could separate no individual feature which could be stated boldly for the information of the readers of *Engineering*. Naturally, I did not strain Messrs. Allis' liberal offer to afford me all facilities, to an inquiry into their cost sheets, and other details of a like nature. The large scale on which operations are carried out; the modern and efficient plant; the quick running tools; the absence of artificial restraints in working; and the splendid handling appliances, were, however, all eloquent as to the manner in which rapidity of construction is attained, and cheapness of production secured. That the commercial management has been of a high order almost goes without saying; but the members of the firm are unstinting in their praise of the engineering ability of Mr. Edwin Reynolds, who for so long has been the organizer and designer of the mechanical features of the engines made by the company. It is to the design of these engines chiefly that they attribute their success; although, it need hardly be said, that without good management and perfect organization, this would not suffice.

In my tour through the shops, I saw in hand eight compound engines, which were being constructed for the Manhattan Elevated Railroad. These are of 7,000-horse power each at normal load, but are to be capable of working up to 11,000-horse power continuously, although not at the same degree of economy. These engines, I believe, will operate all the elevated roads under one ownership in New York. There were also on order 11 sets of engines for the street railway, electric power station on 96th street and East river, New York. These will work to the best economy at 4,500-horse power, but will run up to 7,000 if needed. The main bearings of one set of engines were 35 inches in diameter and 5 feet long. The shaft was of fluid pressed steel, being 37 inches in diameter, with a 16-inch hole. It was made at Bethlehem, about 1,000 miles away from the works. At the time of my visit I was informed there were orders in hand for steam engines to the extent of $1,000,000. With these big engines, at the best point of economy, the steam consumption is about 14½ pounds per indicated horse power per hour. This is the ordinary practice of the firm when using commercially dry steam, having about 20 per cent. of moisture.

Among some of the heavy machine tools in operation may be mentioned planing machines, to take work 10 feet square; a boring mill to operate on a diameter of 14 feet; a lathe to turn 40-feet flywheels, and other lathes of 30 feet and 32 feet capacity. There was a 500-ton hydraulic press for forcing on crank-pins; there were vertical lathes to take 10 feet under the heads and 22 feet in diameter, a new one being in progress to take 12 feet in height and 24 feet in diameter by moving out the standards. This is the heaviest tool of the kind yet made, and is being built especially by the Niles Tool Works at Hamilton, Ohio. The floor space of the shops is 22 acres, and another machine shop, 400 feet square, has just been acquired at Buffalo. This latter is a well-equipped works, and will help to relieve pressure of orders. The firm make their own castings, and attribute a good deal of their success to attention in this department. The working hours are from 7 to 12 and 1 to 6, or 10 hours. A night shift keeps the big tools going. The works are served by one 50 ton electric crane, five of 30 tons, two of 20 tons, and one of 10 tons. All these are run at high speeds, and contribute largely to the rapidity with which work is turned out.

Coal in 1899.[1]

As this has been a year of great industrial activity all over the world, the consumption of fuel has been enormous, and the year's output of coal, easily the largest on record, shows a handsome gain over last year's great total. This improvement has come from all coal producing countries, though most pronounced in those already prominent where the amount of ground opened permits a quick, large increase by the mines in response to any sudden demand. It is to be remembered, however, that manufacturing of all kinds became active in Europe, after the financial distress of the early 90's, sooner than in the United States. Consequently, the increase on the Continent in 1899 as compared with 1898, is not so marked as in this country. It is also to be remembered that the policy of many of the German coal producers is to restrict production even in the face of an advancing demand and higher prices, though such a policy evidently tends to hamper the country's industrial growth. As regards England, our great competitor in coal production, while accurate figures are not obtainable it is plain that the increase in coal mined has been marked. The English collieries have been steadily busy, and their production has been stimulated by the high prices of pig iron and all forms of finished iron and steel. During a large part of 1898 the Welsh mines were idle, owing to a bitter struggle between the miners and the mine owners regarding the rate of wages. This year there have been no strikes of importance in the coal fields, which fact alone will account for part of the increase shown.

There has not been much progress in opening new coal fields in Eu-

Total Production of Coal in the United States—(In tons of 2,000 pounds. Figures subject to revision.)

States	1898. Tons.	1898. Value. Total.	1898. Value. Per Ton.	1899. Tons.	1899. Value. Total.	1899. Value. Per Ton.
Bituminous:						
Alabama	6,466,741	$5,496,730	$0 85	7,559,281	$7,181,317	$0 95
Arkansas	a1,134,064	1,202,108	1 06	a913,743	1,233,553	1 35
California	135,795	334,999	2 47	154,936	438,851	2 83
Colorado	4,125,206	7,219,110	1 75	4,768,531	8,344,929	1 73
Georgia	240,000	156,455	0 65	203,775	183,081	0 90
Illinois	a18,599,299	14,567,598	0 78	a23,434,445	18,443,946	0 79
Indiana	5,435,896	4,729,230	0 87	6,305,639	5,675,075	0 90
Indian Territory	a1,458,098	1,822,622	1 25	a1,404,442	2,106,663	1 50
Iowa	4,117,359	4,759,967	1 16	5,400,000	6,210,000	1 15
Kansas	3,860,405	4,193,160	1 09	3,050,000	4,117,500	1 35
Kentucky	3,492,243	2,479,493	0 71	4,160,000	3,095,136	0 73
Maryland	4,621,618	3,142,700	0 68	5,181,618	4,404,375	0 85
Michigan	178,035	263,492	1 48	250,000	375,000	1 50
Missouri	a2,838,152	3,148,862	1 10	a3,191,811	3,582,111	1 12
Montana	1,450,471	1 902,252	1 31	1,400,000	2,072,000	1 48
Nebraska	500	1,750	3 50			
New Mexico	a863,583	1 416,890	1 64	a1,049,034	1,600,588	1 53
North Carolina	6,144	8,602	1 40	27,094	40,641	1 50
North Dakota	124,526	124,526	1 00	119,441	119,441	1 00
Ohio	14,053,829	10,690,910	0 76	14,967,328	11,973,862	0 80
Oregon	65,871	183,543	2 79	78,400	245,000	3 12
Pennsylvania	64,347,859	38,548,715	0 60	73,563,799	50,023,383	0 68
Tennessee	3,084,748	2,340,346	0 76	3,454,918	2,763,934	0 80
Texas	726,133	1,103,722	1 52	935,840	1,506,702	1 61
Utah	571 417	583,084	1 02	882,496	1,588,493	1 80
Virginia	1,640,000	984,000	0 60	1,387,179	887,795	0 64
Washington	1,988,288	3,301,978	1 66	1,400,000	2,812,500	2 01
West Virginia	16,499,840	9,715,754	0 59	19,000,000	11,210,000	0 59
Wyoming	3,181,905	4,006,756	1 26	3,600,000	4,500,000	1 25
Total bituminous { Sh. tons.	165,208,025	$128,419,354	$0 78	187,843,750	$156,675,876	$0 83
Total bituminous { Met. tons.	149,875,737		0 86	170,410,732		0 92
Cannel:						
Kentucky { Sh. tons.	49,889	$134,700	$2 70	40,000	$100,000	$2 50
Kentucky { Met. tons	45,259		2 98	36,288		2 76
Anthracite:						
Colorado	48,831	$134,285	$2 75	38,348	$105,457	$2 75
Pennsylvania	52,799,774	81,311,652	1 54	56,659,177	90,088,091	1 59
Total anthracite. { Sh. tons.	52,848,605	$81,445,937	$1 54	56,697,525	$90,193,548	$1 59
Total anthracite. { Met tons.	47,943,940		1 70	51,435,657		1 75
Grand total coal { Sh tons.	218 106 519	$209,999,991	$0 96	244,581,275	$246,969,424	$1 01
Grand total coal { Met. tons	197 864,936		1 06	221,882,677		1 11

(a) Fiscal year.

1. From *Engineering and Mining Journal.*

rope. Finds of good coal have been reported, but the increase in production has come from the old and well known districts.

The French output shows its usual small per cent. of gain, the figures last year being 32,439,786 metric tons, while this year shows an increase of about 2,000,000 tons. We have already noted the restrictive policy pursued by many German coal mine operators; notwithstanding the great activity of all lines of industry in the empire during 1899, it need not excite surprise that the output of coal does not show a heavier increase, being approximately 137,600,000 metric tons in 1899 against 127,928,490 metric tons in 1898.

Spain has had a period of internal quiet, and freed from the burdens of war has shown a decided increase in the value and extent of its manufactures. The importations of coal into that country show a decided increase, as should the amount produced.

The Russian mines, particularly those of the Donetz basin and of Western Siberia, are believed to have increased their output. However, the country is passing through an industrial crisis, and it is quite possible that the total output will not exceed the 1898 production of 10,260,000 metric tons.

In England attempts to extend the visible limits of coal supply go on. The most notable development in 1898 were the explorations for the coal measures in southeast Kent, in the hope that coal bearing strata might be found running across the southeastern part of the island, and ultimately connecting with the French coal fields. Drilling has gone on during the year, and some thin seams of coal have actually been found at a great depth. The results as yet do not warrant any development by sinking shafts, much less do they justify any formation of mining companies, but nevertheless they serve to show that there is probably an area of workable coal which will ultimately be developed. The large part of the increase in English coal production comes, as was to be expected, from the Welsh collieries, which would have made an even better showing but for the interruption of shipments on account of many colliers being withdrawn by the Government to supply the fleet. The North of England and Scotch districts have shared in the prosperity of the iron industry, and show substantial gain. England in 1898 still kept her proud position as the greatest coal mining country in the world, but as we noted in our last annual review, the United States was increasing its output at such a rate that England's supremacy could last but a few years more, and might end within a year. The change has come more swiftly and strikingly than we imagined, and the United States has finally passed her only great competitor. England's total production in 1898 was 202,042,243 long tons, and in 1899 about 209,000,000 tons.

In Asia there has not been much done in opening up new sources of fuel supply during the year. Russia has been busy, but the work undertaken has reference more to the future than the immediate present. It is not probable that the output of the mines on the line of the Siberian Railroad between Vladivostok and Khaborovska has been materially increased. The Russians have transferred their energy to northeast China, and on account of the vast amount of work under way on the Eastern Siberian Railroad and at Port Arthur the Shan Tung mines have seen some active development, and have probably made an increased output, but no figures are yet available to show the amount. In China itself little has been done. The inertness of the great mass of population and the corruption of the officials bid fair to remain a bar to the introduction of modern methods for some time yet, and little improvement in mining or in the total amount of coal produced can be expected until foreign capital and foreign mining engineers are given proper protection, either by the Imperial Government or by some European Power.

In India, the British Government has continued to foster the development of the country's natural resources, and the output of the Deccan mines will doubtless show an increase in spite of the check to industrial growth from plague and famine.

The Japanese mines have been busy, and the output for the year should show a substantial gain. Improved methods of mining and improved machinery are being introduced in all the Japanese collieries, and the percentage of coal extracted in proportion to that left is steadily gaining. The Australian collieries have shared in the world's activity, and all show substantial gains in the production of coal as compared with 1898.

Little is known about the coal fields in the Phillippines, about which so much was heard during the war with Spain. Insurrection in the islands kept down any attempt at prospecting the mineral resources, but such information as has come to hand indicates that the coal is of inferior quality and not likely to play any great part in the future development of the East.

In Africa all mining activity is suspended on account of the struggle for supremacy between the Boer Republics and the British Empire. During the early part of the year, however, before the feeling between the resident population and the Uitlanders became acute, the Rand gold mines were rapidly increasing their output, various railroad schemes were projected, and the general industrial condition of South Africa was excellent. It is fair to presume, therefore, that but for the outbreak of hostilities the coal mines of the Transvaal, Natal and the Orange Free State would have shown a handsome increase over last year's figures. What little coal is now mined is for the use of the railroads, and many of the best mines are closed entirely.

Coming to the Western Hemisphere, there is little to note of progress in South America. Good deposits of coal are known to exist in Peru, and also in Colombia, but the entire lack of mechanical aptitude among the inhabitants, a low public spirit and a lack of a sense of co-operative responsibility, make the prospect for industrial growth through native inception very slight. In the Argentine Republic and Chile there has been considerable progress in mining during the year, and the output of coal will doubtless show a gain. The production still falls short of domestic consumption, and large amounts have to be imported—most of it from Australia; but this year large shipments have gone from the United States. Some deposits of coal and lignite in Patagonia and Terra del Fuego, when systematically developed, will doubtless furnish annually a considerable output for the shipping trade.

In North America, outside of the United States, one of the chief events of the year has been the opening of the collieries at Fernie, B. C., by the completion of the Crow's Nest Pass branch of the Canadian Pacific Railway. The coal produced at Fernie is reported to be of excellent quality, and has found a ready, if somewhat restricted, market. In connection with the collieries 150 coke ovens are completed, and their product is in great demand, not only in British Columbia but also in the neighboring States of Montana, Idaho and Washington, to supply numerous smelters. The total output of the Crow's Nest Pass Coal Company's mines increased greatly during the last few months in the year, and is now stated to be about 16,000 tons monthly. The number of coke ovens is being increased, and the production will show a decided increase in 1900. On the west coast of British Columbia and on Vancouver Island the coal mines have had a prosperous year. The shipping trade consequent on the opening of the Yukon gold fields, though less than in 1897 and in the early part of 1898, has been considerable. Increased activity in mining and manufacturing in California has led to larger shipments of British Columbia coal to San Francisco. On the Atlantic seaboard the Dominion Coal Company's properties at Cape Breton have had a very prosperous year.

The formation of the Dominion Iron and Steel Company and the erection of great blast furnaces at Sydney insure a much heavier output in the near future. Other Nova Scotia mining companies have increased their output, partly owing to a better demand in Canada, but chiefly on account of the very high ocean freight rates and the shortage of soft coal along the Atlantic seaboard of the United States in the last half of the year, which led to considerable importations of Canadian coal at points east of Cape Cod. The total output of Nova Scotia mines for the year is 2,642,333 tons, compared with 2,281,454 tons in 1898.

In Mexico there have been very few developments. The Southern Pacific Railroad, which now relies largely on Utah and California coal, brought many hundreds of miles, has been searching for coal in Sonora, where a limited field of coal not of extra quality and lying in thin beds has been known to exist for some time. The explorations, however, are reported fairly satisfactory, and the railroad is preparing to do considerable development. There have been finds of coal reported from other States in the Republic, but the amount of new production is limited, and this year's total output will probably not exceed 400,000 tons, as compared with 367,193 metric tons in 1898.

The United States this year steps to the front as the greatest producer of coal among the nations of the earth. The increase in output over last year has been very great, and at first sight almost past belief. This increase, however, is but the logical outcome of enforced economies imposed upon mine operators and railroad systems during the years of painful recovery from the financial disasters of 1893. As all credit had been badly impaired and all speculative ventures discouraged, the manufacturing and coal mining interests of the country found themselves with a productive capacity built up during a period of great prosperity facing a contracted demand due to the impaired purchasing power of the great mass of the population. Consequently only those concerns which were best equipped or best situated could hope to keep going. Over-capitalized railroads and poorly situated or expensively

operated mines were forced to the wall, and a transition period prevailed in which the best situated mines extended their advantages. Labor-saving machinery, with engines and boilers of latest pattern, became more necessary, and on the railroads heavier track, stronger rolling stock and increased facilities for handling coal were likewise needed. All this stress and forced economy brought out the advantages that certain coal fields have for supplying certain markets, and now that all lines of industry are busy as never before it is not strange that the advantages acquired under adversity should be strikingly manifested in the first year of general prosperity.

The production of coal has been but little hindered by long drawn contests between miners and operators, notwithstanding the advancing market for labor. There have been local difficulties of some moment, one, for instance, in the anthracite district of Pennsylvania, and a few short-lived ones in the bituminous region of the same State. There was also a short-lived strike in the New River field of West Virginia, and some minor troubles in Ohio, Indiana and Illinois. In the last State the extraordinary action of the Governor regarding the outbreak at Virden in the summer of 1898 served to prolong ill-feeling between miners and operators in the Macoupin county fields, and there was more or less friction during the first half of the present year. In Alabama, where the miners are paid on a sliding scale based on the price of pig iron, the great rise in the price of pig gave the coal miners a higher rate of wages than they had ever enjoyed before, and naturally labor troubles were few. There were strikes in Tennessee, but in general, as stated above, the great Eastern coal fields were free from serious disturbances. Much of this freedom is due to the so-called Chicago agreement between the operators and miners of Ohio, Indiana, Illinois and Western Pennsylvania, by which certain rates of wages were established early in the year to hold until a corresponding date in 1900. Further west the union element which has done so much to discourage investments of capital by acts of violence, came to the front at collieries in Montana and Wyoming, causing shutdowns. In Colorado the miners of the northern coal fields had their usual grievance against the operators, who are forced to compete with the output of the mines of the southern coal field for the Denver market, but there were no prolonged strikes.

The only really serious strike of the year was in what is known as the Southwest coal field. This comprises mines in Arkansas, Indian Territory and Southeastern Kansas. The strike apparently was one of those outbursts which, having a reasonable foundation, are fomented by irresponsible demagogues posing as champions of the down-trodden laboring man. It had as a basis a demand for an increase in the mining rate, and this demand appears to have been justified. The strike, however, speedily assumed a more serious phase, the leaders of the Union demanding that the operators should employ only such men as the Union wished, and should not try to bring in miners from West Virginia or other outside fields. The State officials in many cases apparently sympathized with the strikers, and while there were few conflicts resulting in bloodshed, the State courts undertook to nullify decrees of the United States courts. At least one leader of the Miners' Union was sentenced to several months in jail for contempt of court by a United States judge. The contest has seriously interfered with production in this field and is not yet finally settled.

Coal mining has not escaped the tendency toward consolidation of interests and concentration of effort which has been so marked a feature of industrial activity during the year. In the Pennsylvania anthracite trade the so-called independent operators have had their influence greatly curtailed by the efforts of individuals connected with the Delaware & Hudson and Delaware, Lackawanna & Western Railroads and are no longer in a position to cause any serious disturbances in the market. The Lehigh Valley came under the coatrol of Morgan interests. Over 60 per cent. of the anthracite output is now under Morgan control, while the other roads are under interests acting in harmony. The chief changes have been in West Virginia, in Ohio and in the Pittsburg district.

In West Virginia the principal collieries of the New River field have passed under the direct control of the Chesapeake & Ohio Railroad by the formation of the New River Coal Company. In Ohio the Hocking Valley and the Wheeling and Lake Erie roads have been reorganized, while the Pennsylvania has secured control of the Cleveland, Akron & Columbus.

By far the most important consolidations of the year, however, were in the Pittsburg District. This region contains many small mines working on different seams of coal, and the number of the companies has led to much fierce competition, and consequent loss of profits, while the great difference in the character of the mines, and the costs of mining in different localities, or on seams of different thickness, has caused perennial disputes between miners and operators. Hence, the field was one where consolidations could accomplish much good. The changes are described at length by our Pittsburg correspondent.

Purchasers of coal lands were unusually active during the year. The great steel and iron companies have striven to strengthen their respective positions by acquiring reserves of fuel supplies, and have bought up many thousands of acres of coal lands. To note only the more important transfers would require more space than we can give, but it is safe to say that there has not been such a movement in coal properties in many years.

Pennsylvania remains the first State in coal production, and during the year has emphasized its pre eminence. There was a six months' strike among the employees of the Susquehanna Coal Company ; some short-lived disputes in the Pittsburg District and some larger ones in the Northwestern fields of the State, but the only large strike was in the Clearfield region. Here in July many thousand men were out, but only for a few weeks. All the mine operators have had an extremely busy season, and except for the usual let-up in the anthracite region during spring and early summer the mines have had a steadily increasing demand for their product. The result is shown by the year's total of 73,563,799 short tons against 64,947,850 tons in 1898. Illinois holds second place. The Missouri mines have taken away some of the State's St. Louis trade, and increased activity in the Ohio fields has cut into the Chicago business. As noted before, there were some serious labor disturbances in the State, but these were generally compromised by July, and production during the last half of the year was very heavy. The fiscal year's total was 23,434,445 tons as compared with 18,599,299 short tons in the fiscal year 1898.

Indiana mines also shared the great prosperity of the Middle West, and though there were local disturbances between miners and operators, here, as in Illinois, the interstate agreement governing wages was generally adhered to, and work has not been seriously interrupted. The State's output was 6,305,639 short tons compared with 5,435,896 short tons in 1898.

Ohio has also benefited somewhat by the year's prosperity. During a large part of 1898 the mines in the Hocking Valley region were closed, and many miners were in abject poverty. The improvement which came in the last months of the year continued through 1899, and the year's output has been heavy. There has been no serious disturbances to production except the short supply of railroad cars, which all mining States have felt, and the total output is 14,967,328 tons compared with 14,053,829 short tons last year.

West Virginia has shown the most striking developments of the year. The old mines kept up their record, and those which supplied the Atlantic seaboard trade found themselves in the last half of the year confronted by a demand they could not begin to supply. Many of the small operators of the Pittsburg District, after the consolidation of interests there, took their cash and experience into West Virginia, and are preparing to open new mines. Next year's output will undoutedly show a marked increase over this year's, and the State should easily surpass Illinois. The total production this year was 19,000,000 tons compared with 16,499,840 short tons in 1898.

Michigan shows a decided increase in output from its mines, which are principally those about Bay City and Saginaw. The year's output is about 250,000 short tons, a good gain over last year's figures, 178,035 short tons. Kentucky and Tennessee mines have been busy, though in the latter State labor troubles have interfered to some extent with the production.

Alabama, owing to the very prosperous state of the Southern iron industry, has had an exceptionally good year, and its output of 7,559,281 tons shows a gain of 1,092,540 tons over last year. The course of the industry during the year is described by our special correspondent.

Of the States west of the Mississippi, Missouri shows a handsome gain. Manufacturing has been active, and labor troubles in the Kansas fields have helped the Missouri operators. The year's production was 3,191,811 tons compared with 2,838,152 short tons in the last fiscal year.

Iowa, like Illinois and Missouri, has benefited by the great activity of all manufacturing industries in the Middle West, and shows the heaviest gain for the year, its output being 5,400,000 tons as compared with 4,117,359 short tons last year.

Of the States further west, Montana and Colorado have both had labor troubles which have restricted production, though Colorado shows a gain. Wyoming has had a favorable year, and shows a good increase.

Total Production of Coke in the United States.—(In tons of 2,000 pounds. Figures subject to revision.)

States.	1898.			1899.		
	Tons.	Value.		Tons.	Value.	
		Total	Per Ton.		Total	Per Ton.
Alabama	1,541,250	$2,620,125	$1·70	1,834,550	$3,889,246	$2·12
Colorado	445,925	1,226,294	2·75	455,783	1,253,403	2·75
Georgia	50,000	63,500	1·27	44,529	92,748	2·08
Illinois	3,000	4,950	1·65	3,000	6,600	2·20
Indiana	1,521	2,662	1·75	2,000	4,500	2·25
Indian Territory	(a) 34,810	78,323	2·25	(a) 29,362	95,426	3·25
Kansas	10,000	20,000	2·00	75,000	187,500	2·50
Kentucky	21,394	30,593	1·43	45,000	66,496	1·48
Montana	70,245	529,825	7·54	56,500	431,095	7·63
New Mexico	(a) 2,275	5,119	2·25	(a) 33,661	76,410	2·27
Ohio	100,000	250,000	2·50	110,000	275,000	2·50
Pennsylvania	10,671,920	21,663,998	2·03	13,339,900	23,344,825	1·75
Tennessee	394,545	710,181	1·80	441,890	883,780	2·00
Utah	28,327	127,809	4·51	25,700	122,830	4·60
Virginia	525,000	703,500	1·34	550,008	775,511	1·41
Washington	62,720	219,520	3·50	56,000	200,000	3·57
West Virginia	1,916,482	2,184,789	1·14	2,225,000	2,670,000	1·20
Wyoming	18,393	64,375	3·50	16,000	56,000	3·50
Total coke { Sh't tons.	15,897,797	$30,505,563	$1·92	19,344,883	$34,431,360	$1·78
Met. tons	14,422,387	.....	2·12	17,549,562	.....	1·96

(a) Fiscal year.

On the Pacific Slope the Corral Hollow mines, at Tesla, California, the only mines of importance in the State, have been worked to their full capacity.

Washington mines have had a fair year, but the output of coal shows a heavy decrease, being about 1,400,000 short tons, compared with 1,988,288 short tons in 1898.

While everything favors an excellent demand for coal during the coming year, it is evident also that the fuel will command generally higher prices. All the coal carrying roads are talking of higher freight rates, and in some cases these rates have already been made. The various consolidations already formed will undoubtedly try to keep business on a profitable basis. It is clear also that the miners are going to get better wages. The interstate conference between representatives of miners and mine operators will be held at Indianapolis, opening January 15th. The present basis for mining is 66c. for runs of mine coal, and it is altogether likely that this rate will be increased to 75 cents. In the Georges Creek region of Maryland the operators are likely to grant an increase of 10 cents a ton in the mining rate. The West Virginia miners have formulated a demand for an advance of 15 cents a ton after April 1st, when their present agreement expires. This agreement chiefly applies to the Kanawha field, the New River miners having secured an advance of 5 cents during the summer, while conditions in the Pocahontas field are still a barrier to the organization of labor unions there. The Clearfield miners, in Pennsylvania, will also secure a substantial advance on April 1st.

While coal must therefore be higher, consumers will pay the advance without demur. The demand should be enough to keep producers busy for the year, but it is not to be supposed that this condition of things will last. West Virginia alone is making enormous strides in opening up coal reserves, and the present high prices will stimulate mining in less favored fields. The railroads are improving their rights of way and adding better rolling stock, thus increasing average train loads, and consequently reducing ton-mile costs. It is altogether likely, therefore, that in a few years the total amount of coal offered will exceed the amount wanted at current prices, and the prices will fall even below the low figures prevailing last year. While this may not be altogether a blessing for the coal miner and operator, yet it will give American iron and steel manufacturers a sure grip on the markets of the world for the opening years of the coming century.

Opening for Mechanical Engineers in China.

[By Lord Charles Beresford, before the British Institution of Mechanical Engineers.]

Although the civil engineer must first clear the way, there is a great scope even now for the mechanical engineer in China, and the future offers an almost unlimited field of operations. Imagine an empire which, with its dependencies, covers an area of over four and a quarter millions of square miles, and has a population of nearly four hundred millions of people, and then conceive this vast expanse of territory and this multitude of people still pursuing the arts and industries with the primitive tools, methods and ideas of two thousand years ago. The vista of untapped possibilities for the modern engineer is seen to be extensive and promising. I propose, in this paper, to divide the principal openings for the mechanical engineer under three heads, and to shortly touch upon each. I may class them as follows: (1) Railways and electrical engineering, (2) mining and allied works, (3) manufactures.

Railways.—Under the first of these headings I venture to suggest that the immediate development of China will most rapidly proceed. As already shown in my book, "The Break-up of China," at the date of my visit 317 miles of railway had been completed, 2270 miles were building, 2507 miles were projected and had been or were then being surveyed by the pioneers of your profession—the civil engineer—and 1070 miles had been projected but no surveys had yet been made, so that altogether in the next few years we ought to see over 6,000 miles of track laid, and a new and important department will have been created for the mechanical engineer in running, building, and repairing the locomotives and other rolling stock used by the Chinese and foreign proprietors of these railways. I may mention that the energy, the pluck and the signal abilities of C. W. Kinder, who is a distinguished ornament to your profession, have already led to the erection of most extensive works at Tongshan. These works construct all their rolling stock except locomotives, but were engaged on the first engine ever attempted to be built in China at the time of my visit. Mr. Kinder estimated to be able to build engines at $8,000 which would cost $14,250 at home—with a 24 months' delivery. His greatest difficulty is the lack of skilled labor. Mr. Kinder pays good wages. The Russians who tempted some of his engineers away are now paying less than Mr. Kinder, and he told me that the men wanted to come back to him. The engines already running on the Shan Hai Kwan Railway are made by Dubs, of Glasgow, and Baldwin, of America. The American engines are much lighter, and not so good as the British, but are quite good enough for the work. The Americans use steel instead of copper or brass for fittings, and the axle, instead of being one piece of metal turned so as to leave a solid collar for the wheel, is made in three parts, the collars being separately made and screwed on to the axle.

The idea that skilled native labor is cheap is quite fallacious as far as North China is concerned, the native workmen getting sixty dollars a month. During the twelve months prior to my visit, two locomotive boilers had been replaced and four retubed, while five locomotive fire boxes had been replaced with the assistance of native labor. Mr. Kinder estimated that the 300 miles of rail to Shan Hai Kwan cost for everything—including, that is, the admirably fitted workshops I saw at Tongshan—about $30,000 a mile. Close by the machinery shops were some cement works, but the machinery there was rusting and doing nothing. The works had been started by Chinese, but owing to their curious inability to undertake mechanical or manufacturing work without European supervision, the works had been a failure. Mr. Kinder told me that the railway alone took 60,000 or 80,000 barrels of cement a year, and there was a great demand for it elsewhere, but the works were now closed.

In addition to the labor difficulty, which can be easily overcome when skilled mechanics realize the advantages offered to them in China, there is also another difficulty to contend with—the Chinese hatred of the "foreign devil." There was some rioting and ill feeling at the time of my visit, and two of Mr. Kinder's engineers were fired at and also badly beaten at Fungti. As an example of the futility of British methods in China, my attention was drawn to the fact that, instead of at once demanding the punishment of the ringleaders, and the withdrawal of the Chinese Kan Suh troops who were responsible for the outrage, the British authorities summoned a conference of the whole of the foreign Ministers, and as a result of their united action two of the offenders were mildly whipped, receiving exactly the same punishment as some coolies who damaged a pump handle and a piece of hose pipe—total value $2—a few weeks before. Mr. Kinder was so dissatisfied with this that he at once withdrew his engineers, and the soldiers, emboldened by the mild treatment awarded to their comrades, proceeded to damage winches and boilers at Pei-ho-tien, and to strip off some copper tubing.

The matter was, however, soon afterward settled, and the Kan Suh troops withdrawn.

Electrical Engineering.—I have placed electricity under the first heading because I learn from the ordinary channels of information that since my return from China it has been rendered possible for the traveler to go from the railway station to the gates of Pekin by electric traction. I, personally, was carried into the city in a Mandarin's chair, while my staff rode on Chinese ponies, and, judging by the then state of the roads, to have so soon laid and started an electric tramway is very creditable to the promoters of the enterprise.

In the European settlements electricity is already used for lighting purposes, and even at Hankow, 600 miles up the Yangtse River, some of the firms were laying down electrical plant. The abundance and

cheapness of coal will render this branch of industry—electrical engineering—a very profitable one in a short time. The Chinese of the better class are very fond of luxury after European modes, and I have no doubt that they will be ready consumers of electrical power for lighting and manufacturing purposes. Of course all the plant must, in the first instance, be imported, and I would like to point out to this institution that we are far behind Japan and America in the use of electrical power, and unless we are much more energetic the vast electrical plant which China will require will come from those countries. It is more than probable that Japanese and American engineers who accompany the plant to China will be employed there hereafter instead of British engineers. The reason of this I have shown by examples in my book, "The Break-up of China." At Kioto, in Japan, I saw the great electrical plant which, in addition to lighting two-thirds of the town, also supplied the motive power for the city trams, for the pumping machinery at the water works, and for no less than sixty industries in or near Kioto. The electric energy is produced by water power from a fall of 120 feet. The plant is chiefly American, but the Japanese are now beginning to make their own.

Telegraphs already exist all over China, and are the Government property. They are badly managed. I was credibly informed that it is often possible to go from Pekin to Tientsin and thence to Shanghai, and to arrive before a telegram you had dispatched at starting. By paying treble rates it is possible to get reasonable speed, but the service is very inferior. Telephones exist in some of the settlements, but one manager of a telephone company in China told me that all their cop per wires were stolen by the Chinese, so that they had very inefficient service with steel wires.

Mining.—The mechanical engineer who has adopted that branch of his profession which has to do with mining machinery, boring machinery, hydraulics and allied works will find that there is plenty of scope for him at this moment in China. The country is full of minerals; coal, iron, gold, silver, copper, mercury, lead and salt are all to be found in paying quantities, and only skilled workers and the latest machinery are needed to develop the rich resources of this marvelous country. Labor can be had for mining work at the ordinary coolie pay of 200 cash, about 11 cents a day. Our friends the Russians are probably much alive to this important feature in Manchuria, where an Englishman showed me specimens of gold obtained by himself in the interior, and another Englishman who has lived for years in the country told me that Manchuria was a white man's country, very healthy and bracing, and with a climate, soil and resources closely resembling Vancouver. But Manchuria is not the only place where minerals are found. All over China there are great deposits I need only allude to the marvelous coal fields of Shansi, with seams 80 feet thick, which the Pekin syndicate are about to work; to the resources of Shantung, where I have seen a German missionary map marked in all directions with notes of gold, coal, iron and other minerals, also to the coal fields and iron mines of Ranyang and other places in the Yangtse, and the many other districts where minerals have been found, to show that the riches of China in this direction are incalculable. All of these vast stores of underground wealth belong to the Chinese Government. Imagine if the British Government owned all the mines in this country, and could charge a handsome royalty for the right to work them, and it will be seen how great are China's undeveloped sources of revenue.

The mining engineer must necessarily understand all about pumping machinery and hydraulics, and if at first there is little opening for him in his proper sphere, I should suggest that he make use of his knowledge in another direciion. There is a great field for mechanical engineers in most of the old and all of the newer concessions and settlements, in supplying water to the European community. At a place like Han kow, for instance, where there are no water works at all, there is not only the European community, but the Chinese, on the other side of the river, who would be glad of water works. At present all water has to be boiled before use, and is even then unpleasant. There is a project for supplying Canton with water, which a countryman of mine, a former M. P., is now actively engaged on.

For mining machinery, engines, pumps and all other plant of this description there is a great demand, and only capital and British me chanical engineers are needed to give a great impetus to our manufactures of these goods.

Manufactures.—The abundance of coal and iron in China makes it absolutely certain that China will some day become a great competitor with us in the industrial market. But so far from fearing this competition, British manufacturers should reflect that if they are wise and take time by the forelock China will for many years to come be an enormous buyer of machinery and tool steel, while before the necessary reaction can come about and we begin to feel the effects of her competition, China will have become so rich that the increased amount of our products which she will take in one direction will counterbalance our losses elsewhere. There are other points for us to remember. (1) A poor country can never buy very much from other nations; (2) supply creates demand, despite the seeming paradox; and (3) the volume of trade keeps increasing, even if individual industries suffer. To explain what I mean:

(1) If China is a good customer of British goods now she will become a better customer still when she has more money to pay for them. She can only get this money by exploiting her minerals and becoming a manufacturing country with large exports. The richer China becomes the more she will become a purchasing power.

(2) Again, it is an undoubted fact that an increase of supply increases the demand for an article. This partly arises from the increased supply cheapening the cost both to the manufacturer and consumer. The introduction of machinery, although at first opposed by the more ignorant, has thoroughly proved this, especially in the case of Arkwright's invention of the spinning jenny in England. Another instance of this is the case of all uncivilized races, or races where civilization has stood still, as in China. A few men only can live, and barely live, on a huge expanse of country if each subsists by the food he himself produces, but if on that same extent of country a number of men congregate and set up machinery and work shops, each becomes a specialist and supplies the whole community with an article which he and a few others alone produce, and the land supports more people than when each person supplied his own necessities.

(3) If China becomes a manufacturing country she will undoubtedly hit individual British industries, but as long as the volume of our trade increases we need not fear. Our manufacturers will make money in fresh directions. Coventry is an example of what I mean. The destruction of the ribbon trade seemed to threaten Coventry with bankruptcy, but the rise of the cycle industry has made the town ten times more prosperous.

I visited a great many mills in China manufacturing both cotton and silk. In every case I found that the mills under entire Chinese management were complete failures. Their system is to pay high dividends and put nothing aside for depreciation of machinery, and so the whole place goes to rack and ruin, and when the inevitable crash comes it practically means laying down completely new plant. The silk industry is being killed by adhering to old fashioned methods, and the Japanese, by introducing modern machinery, are competing to the disadvantage of China's silk trade. The tea trade is declining for similar reasons. Some remarable facts were lately brought to my notice about the tea industry in India. The improvements which have been made from hand to machine manufacture have undoubtedly played a very great part in the steady advance in popular favor of Indian and Cingalese teas. The old hand made process took up an enormous amount of room, required 15 people to produce each 100 pounds of tea, and took a great deal of time. The introduction of British machinery by Davidson has led to a cleaner, more satisfactory and more rapid mode of manufacture, which occupies a quarter of the time and requires only one-fifth of the labor. Thirty years ago it was impossible to land tea in London under 37 cents per pound; to-day the grower, by the aid of machinery, can land and sell tea wholesale in London—at a profit to himself—for the price of 16 cents per pound. I think it only right to direct the attention of mechanical engineers to these important questions of the manufacture of silk and tea, as I believe that British companies, established in China at treaty ports on British concessions or settlements, could buy up from the small Chinese farmers large supplies of raw silk and green tea, and by improved methods of manufacture and modern machinery produce in each of these industries a superior article, which would find a ready sale.

The Chinese were also very delighted with me at other arsenals having no European superintendent, when I showed them how to set their speed and feed gearing for the steam tools.

In referring to the openings for mechanical engineers in China, in assisting the established manufactories with modern machinery, and under European supervision and direction, the native wage is, of course, an important point to be considered. I found that in South China the current rate of wages for common coolies was 40 cents a day; fitters, 75 cents a day to $1.25 a day; smiths get 60 cents to $1.50 a day; carpenters, 50 to 80 cents a day; masons, 60 cents a day; and mill and refining hands, 30 cents a day.

Another opening for the mechanical engineer is to establish himself

as an agent for British machinery in the foreign settlements and concessions. Over and over again I saw British machinery with the name plates removed and German and Belgian names substituted, or where the name of the British firm was stamped in, it had been covered over by German and Belgian name plates. This was notably the case at the iron mines at Hanyang and at one of the arsenals, where I saw some of Whitworth's tools so treated. I pointed this out to a Chinese merchant, and he explained it by saying that the Chinese usually bought their machinery through local agents in preference to sending abroad for it. These agents, he said, were more often than not Germans or Belgians, who understood machinery. The advantages of buying locally from an agent were threefold: (1) Quicker delivery, as the machinery was often in stock. (2) No trouble about the rate of exchange increasing the cost after it was ordered. (3) The local agent could be held responsible for defects, and was available for repairs if anything went wrong. I think this is a very important point for engineering firms who are members of this Institution, and it also offers an opening for young men who are good mechanical engineers to take up the sale of British machinery, and to push it in preference to that of other countries,

In connection with this matter I wish to draw the attention of engineering firms in Great Britain to the immediate necessity of establishing an exhibition of British machinery in China, with mechanical engineers to explain and show its capabilities. The Chinese are a very practical race, and if they see what machinery can do, they will often buy it. Both the Americans and Germans are already taking steps to provide such exhibitions of their goods, and it will have a serious effect on British machinery if we allow them to forestall us.

New Machines Needed.—There is one other point to which I should like to refer before leaving this subject, because, although it concerns the manufacturer of goods more than the mechanical engineer, it also affects the latter, who would be benefited by any change in the state of things I am going to draw your attention to. From various points which were brought to my notice I was satisfied that one of the reasons why the British manufacturer fails to supply what the Chinese really want, and is losing ground against American competition, is the fact that our machinery is so often old and nearly obsolete. The British manufacturer does not write enough off his profits for depreciation of machinery, and he does not avail himself of the latest machinery, from an idea that it will not pay. The United States is far ahead of us in this respect. I recently saw a wire machine in New York which cost $9,000, and was consigned to the scrap heap after 12 months, to be replaced by improved machinery. In great Britain one man controls one block for wire pulling machinery, whereas in the United States one man controls four blocks. The United States workmen get higher wages, but their food, clothing and rent are proportionately dearer. In Pittsburgh 11 to 14 kegs of nails are turned out by one man in a day, and the man gets $2 00 a day wages. In this country only six kegs of nails are produced for $1.50 a day. Improved machinery means a larger output for less cost, but it does not necessarily mean that the workmen suffer. On the contrary, the increased output and the reduced cost of production so cheapen the article that the demand increases, and in the end more men are employed than before, and wages are also higher.

Learn the Language.—In conclusion, and by far the most important point for the mechanical engineer to deal with, in my humble opinion, is the question of learning Chinese. I venture to invite the attention of this Institution to the immediate necessity of training young mechanical engineers to learn Chinese, which can only be properly done by establishing a school of mechanical engineers in Hong Kong. The official Chinese should be studied, as all well educated Chinese learn this, but for practical purposes, and conversing with laborers, each man must become a specialist in the dialect of the province in which he proposes to work. Americans and Germans are both doing this.

For the benefit of mechanical engineers who are prepared to earn their livelihood in China, and to assist in the opening up of the country which is now going on, I will summarize the points where I think there is the best prospect of immediate openings:

(1) Railways.—For all work in connection with railways the advice of M. Kinder, the engineer-in-chief of the Chinese Imperial Railways, should be sought, and applications for employment should be made to the various syndicates financed by the Hong Kong and Shanghai Bank, particulars of which can be obtained in my book.

(2) Mining work is being undertaken by the Pekin Syndicate, which is the most promising venture at present, and by Pritchard Morgan's Syndicate, which has obtained valuable concessions in the Yangste Valley. Both of these syndicates are well supplied at present with civil engineers, but there will doubtless be many openings for mechanical engineers in the near future. Electrical and hydraulic engineers should look out for the prospects of employment by the municipalities in the European settlements, and by large firms.

(3) Advertisements in the Anglo-Chinese papers in Tientsin, Shanghai, Hankow and other places should for the present be the best means of securing billets in China for mechanical engineers willing to enter the employment of British or Chinese manufacturing firms.

The Smokeless Combustion of Soft Coal.

[By Mr. William Kent, M. E., in *Stevens Inst. Indicator.*]

The smoke nuisance in our cities is a question of increasing public interest. Even in eastern cities, the atmosphere of which was formerly smokeless, the question is a live one, for soft coal is being substituted for anthracite in many factories and power plants.

There is only one excuse for smoky chimneys. That is that it is costly and troublesome to a factory owner to put in an appliance which will prevent the smoke. There are many such appliances in use, some of which will prevent smoke entirely, if properly designed and properly managed. Others are only partially successful, working fairly satisfactorily when the furnace is being driven slowly, but failing when it is driven rapidly.

The theory of the production of smoke and of its prevention has been published over and over again, largely as a restatement of the sayings of Charles Wye Williams and other authors of forty or fifty years ago. In the writer's opinion most of these statements of the theory have been imperfect because they did not consider all the circumstances and difficulties of the problem, nor all of the conditions which must be secured before smokeless combustion of soft coal is possible.

The following is believed to be a correct statement of the reasons why smoke is produced in an ordinary hand-fired steam boiler furnace, in which the grate surface is directly below the shell or the tubes of the boiler:

1.—Where fresh coal is fired on the bed of very hot coke, lying on the grate bars, the moisture and the volatile gases are distilled rapidly in great volumes.

2.—Instead of the gases at once being brought in contact with very hot air, which is needed to burn the smoky gas, the air is at first almost entirely shut off, both by the mechanical action of the fresh coal choking the air passages through the hot coke, and, later, by the generation in great volumes of steam and gas from the fresh coal, which destroys the partial vacuum due to chimney draft which tends to draw air through the grate bars.

3.—The production of this steam from the moisture in the coal and the distillation of the gases is a cooling process. The furnace is chilled just at the time when it should be hottest.

4.—The dull smoky flame made by the partial combustion of the gases, instead of being given time and space in which to complete its combustion is instantly brought in contact with the cooling surfaces of the boiler, causing the deposition of soot and the production of black smoke.

In order to burn coal without smoke, the four conditions above stated should be avoided, or neutralized, thus:

1.—The gases should be distilled from the coal *slowly.*

2.—The gases when distilled should be brought into intimate contact with *very hot* air.

3.—They should be burned in a hot firebrick chamber.

4.—While burning they should not be allowed to come in contact with comparatively cool surfaces, such as the shell or tubes of a steam boiler; this means that the gases shall have sufficient space and time in which to burn before they are allowed to come in contact with the boiler surfaces.

The first condition of smokeless combustion is attained by many of the mechanical stokers, which feed the coal in slowly, but they are not successful as smoke burners unless the other three conditions are also obtained in the furnace.

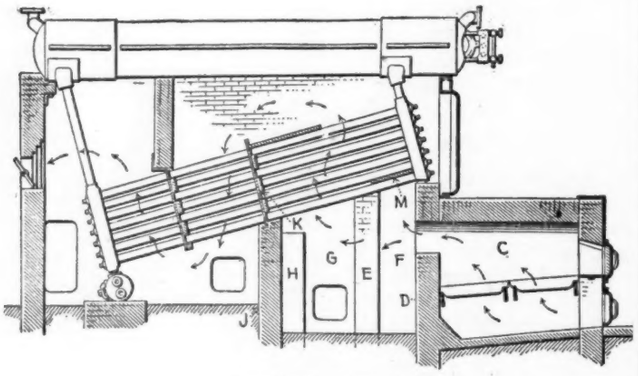
The second condition is attempted to be met by those devices in which air is heated by passing through flues or pipes, but these devices usually fail because they do not supply enough air, and hot enough air, at the time when it is most needed, that is, just after fresh coal is fired.

The third and fourth conditions are violated in all ordinary boiler furnaces, in which the bed of coal is directly under the boiler.

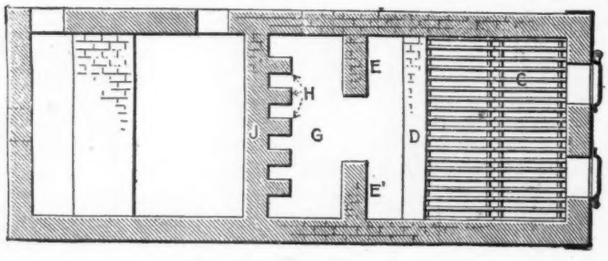
The writer has recently patented a steam boiler furnace in which the four conditions of smokeless combustion are obtained to a greater

degree of perfection, it is believed, than in any other hand fired furnace. The accompanying cuts illustrate this furnace as applied to a water tube boiler.

Referring to the cuts, *C* is a fire chamber or oven, built of brick and



Longitudinal Section.



Horizontal Section through Furnace.

extending out in front of the boiler. In it the fuel is burned, either on the ordinary grate bars or by means of a mechanical stoker. *D* is the ordinary bridge wall. *E E'* are two tall vertical walls built some distance in the rear of the bridge wall. *G* is a combustion chamber. *H H* are several piers of fiebrick, projecting into the chamber *G* from the rear wall *J*. *K* is the ordinary partition wall built across the tubes, and *M* is a tile roof to the chamber *F* to prevent the gases in that chamber from reaching the tubes until after they have passed through the narrow vertical passage between the wing walls *E E'*.

In operation, the fresh coal is spread alternately on the right and left sides of the grate at equal intervals of time. Immediately after firing on one side, dense, smoky gases arise on that side, while on the other side an excessive supply of very hot air is passing through the bed of partially burned coal or coke. These two currents, one of cool, smoky gas and the other of clear, hot gas with a large excess of air, pass side by side over the bridge wall *D*, but they are compelled to change their direction and mingle together on passing through the tall, narrow passage between the wing walls *E E*^{1}, and by so mingling, the gases are burned and smoke is prevented.

The combustion is assisted by the heat radiated from the walls of the combustion chamber *G* and the piers *H*, which absorb heat during the time when the fire is hottest—that is, just before fresh coal is spread on the grate—and give out heat to the gases in the chamber *G* when the fire is coolest—that is, just after firing, when the smoky gases are escaping.

The four essential conditions of smokeless combustion are thus provided for:

1. Fresh coal is fired on only one-half of the furnace at a time. This causes only one half of the volume of steam and smoky gases caused in the ordinary way of firing, so that one half as much has to be taken care of at that time.

2. The other half of the fire bed has an excess of hot air passing through it at the same time, and this excess of hot air is used to burn the gases distilled from the freshly fired half.

3. The wing walls compel the mixture of the two currents, one of smoky gas and the other of hot air.

4. The long runs of the gases, through passages surrounded with hot firebrick, between the fire bed and the boiler surface, gives them time and space in which to burn.

By smokeless combustion secured in the manner described, economy of fuel will necessarily follow. The percentage of saving of fuel which may be obtained will depend on the character of the coal, being greatest with the highly volatile and very smoky coals of the far West.

The Outlook in the Iron Trade.

By Mr. James A. Green, Cincinnati, Ohio, in *Iron Age*.

In the familiar story of Joseph's great wheat corner the seven fat years preceded the seven lean years. At this time we trust to see history repeat itself, with the order, however, of the fat and lean years reversed. We have had seven lean years, and in the iron business we certainly deserve to be recompensed. To the younger men in the trade a year ago the possibility of such a year as we have just experienced seemed remote indeed. The memory of 1895 was too recent. That was the year of glorious expectation. Its hopes were as irridescent as soap bubbles and probably as brief lived. The man who alluded to the "soda water rise of 1895" very felicitously described the situation. That year for the first time for many months the market went up by leaps and bounds, and it looked at last as if the long-expected change had come for good. But the rise lasted only for a period of six months, and then the market went to pieces and the demoralization in prices and industry was worse than it had been. It was after 1895 that pig iron went to $6 at Birmingham, and no matter what may be said about the unrivaled natural resources of Alabama, no matter what may be said about the cheapness of labor there, it is impossible to profitably make iron at $6 a ton. While with every condition favorable, it is doubtless true that iron can be made at $6 a ton, yet that leaves no margin for the necessary repairs, replacements and the fair manufacturing profit. But with the long period of low prices before them, and still full of the broken hopes of 1895, the younger men in the trade had begun to feel as if the iron business had settled down to a point where any great and marvelous change in values was practically out of the question. Eighteen hundred and ninety-nine has changed their ideas. It has demonstrated the fact that history in the trade most decidedly repeats itself. Gray forge iron has gone from $6 at Birmingham to $16 at the present writing. No. 2 foundry has risen from $7 to $17.50, and No. 1 foundry has gone from $8 to $18.50, and these prices are not nominal in any sense of the word. They are the actual prices at which iron has been selling for months, and they have been obtained without the slightest difficulty, not only for quick shipment, but on orders that call for delivery 12 months ahead.

The year has seen a tremendous reversal of form, to use a sporting phrase, and to take Alabama, for instance, in January out of a total of 40 stacks there were 18 in blast on coke iron. At the end of November there were 25. On January 1 Alabama had 29,000 tons of iron in stock; on December 1 it had 6,000 tons. But the most significant item of statistical information as regards the South is the fact that in Alabama there were on January 1 107,900 tons of iron in the warrant yards, while on December 1 this had been reduced to less than 6,000 tons, and in forecasting the probable future of the market this fact must be taken into consideration. In addition to the public yards there were private storage yards in the South containing large quantities, and these have all been emptied.

The warrant yards in the South were like the fat which the camel accumulates in its hump, and which, when food fails, it slowly consumes. The fat in the camel's hump in this particular is all gone, and there is not the slightest possibility of its being replaced. During 1899, to use another simile, the warrant yards seemed, to a number of the largest consumers in the market, like a providential reservoir, from which they were able to draw their supplies as they needed them at better prices than the furnaces were quoting and with the certainty of sure delivery. It is a fact, too, that the warrant yard iron was not universally distributed among consumers by any means. The great bulk of all the warrant iron in Alabama was taken by a few of the immense consolidations which were formed in the early months of this year. In the past these consumers had been the largest customers of the Southern furnaces, and while they have bought very heavily from the iron furnaces, yet the warrant iron came in for them most opportunely. What they will have to do in 1900 needs no prophet to tell.

If any iron has been sold for delivery into warrant yard the quantity is too insignificant to mention, and of course if it has been sold the prices obtained for it have been high. Certainly no iron is now going into warrant yards. An actual present experience in the matter of warrants sheds a great light on the situation in that particular. On December 19 an offer was made on the New York Metal Exchange

by a *bona fide* consumer on 2,000 tons at a price $1 above the published quotations of the exchange. This offer was not made for any unusual grades, but for 500 tons each of Nos. 2, 3 and 4 foundry and gray forge, yet it was found impossible to buy a single ton. Even before July 1, 1899, consumers began buying for 1900 delivery. There has been a great and steady buying movement for long forward delivery, and as a natural result the Southern furnaces begin the new year with an immense tonnage booked ahead. Not only this, but because the iron masters anticipated making more iron than they really were able to turn out, they are carrying over into the new year a very large tonnage which should have been shipped in 1899. This leaves but little iron free to sell for the first half of the year, while already a good part of the probable output for the last half has been sold. Then, too, it must be remembered that the largest producers in the South, the Tennessee Coal, Iron and Railroad Company, have started their steel plant at Ensley. This plant has a battery of ten open hearth basic furnaces, and it will take a large block of iron out of the market.

No man can tell how consumption is going to keep up. But careful observation justifies the belief that it is still increasing. We do not know of a general foundry that has not more work than it can turn out on time. In fact, most of the foundrymen are like the ironmasters in that they have orders booked up to their capacity or in advance of it for many months ahead. The majority of them have bought freely for forward shipment, yet some are still taking chances on the market, while a large proportion of those who have bought have not bought all they will need and will have to buy later to complete their requirements. The mills find themselves similarly placed. Here, for instance, are the great company who have more rolling mills under one management than any other industrial organization in the world telling their customers that on certain classes of finished material they can make no more for delivery prior to September. That tells its own story.

For the greater part of this year the railroads have not been able to adequately handle the business offered them. All sections of the country alike have suffered from freight blockades and from an inability to get enough cars to move freight promptly. The year demonstrated the fact that it was impossible on short or long notice to at once put all the available furnace capacity of the country into blast, and it no less forcibly demonstrated the fact that the railroad facilities of the country, great as they are, need to be much increased to meet the demands of the situation. The extensive additions which the railroads have made to their rolling stock show that they appreciate the necessities of the time. But what they have done this year is only a modest beginning to what they should do, and fortunately for them they are hand ling all freight at higher rates, so that their revenues have been proportionately increased. At the beginning of the year freight rates were badly demoralized. It is a matter of such common knowledge that there is no impropriety in saying that the railroads were practically allowing shippers to fix their own rates. Early in the year the railroads were able to absolutely restore published tariff rates and since then they have advanced them materially. This increase in rates, together with the increase in tariff, will put the railroads in a position not only to add to their rolling stock but to make needed betterments and extensions.

Such is the vastness of railroad interests in America that their prosperity must necessarily have a tremendous influence on the general business of the country. And the railroads are the foremost users of iron. They have not been deterred in the slightest degree from making improvements and additions by the increased price of iron. In fact, they waited until iron had reached a fine price before they began to be felt at all in the market as buyers. As far as can be seen, in no class of material made from iron will the higher prices as yet really operate adversely. There is no better known law of trade than that it is easy to sell goods when all prices are high and hard to sell them when all values are low. The first case means general confidence and prosperity; the other the reverse. The single exception to this is found when one hears from the makers of fencing wire and agricultural implements. They say that the farmers have so long been accustomed to certain prices that they will not pay more and that they will simply get along without new fences and implements rather than pay the prices which must now be asked. How far this is true remains to be seen. Certainly the agricultural implement manufacturers are not acting as though the situation frightened them, for they are all pushing their work.

Unless there arises some radical and unforseen contingency this fear that present prices will lessen the demand for iron and steel finished products will prove unfounded. Prices have not gone high enough to cause any such trouble. Those making this argument are probably not taking into account the fact that previous prices were ridiculously low and out of all proportion to what they really should have been. And when prices were low an immense amount of work was postponed, put off, in fact, because there was so little confidence in the future, and this work must now be done. There are great public and private repairs that cannot now be longer deferred.

As indicating the feeling of the largest of the Pittsburg manufacturers it is stated that they have placed an order with the Bessemer Iron Association for every ton that may be made in excess of orders already placed at the full market price to-day.

If there is an element of weakness in the pig iron situation it is hard to discover it. The advance in the prices of pig iron in 1899 rested on no boom foundations. It came from an actual demand for iron greater than the capacity of the country to supply. It came at a time when the main available Southern stocks of metal, which had been accumulated during the years of depression, had been taken up by the export trade. It was gradual and healthy. Speculation at no time entered into it, yet it is hard to say much more than this because happily we are writing not of something that is past and gone but we are writing of what now is. All the conditions that made 1899 are still in force, many of them with more intensity than at any time since the beginning of the year. Nineteen hundred opens more auspiciously than any year since the memory of most men now in active business. And it is to be hoped that the time when one can sit down and write the history of the present business expansion as a finished document is far distant.

The Future of Electric Illumination.

By Mr. Jean Wetmore, in *Electricity*.

It is many years since any important radical change has been made in electric illumination. The incandescent light is practically where it was left ten years ago. Arc lights have only minor improvements to show in mechanical construction. Both the above forms of light have been much cheapened in construction and selling price through wider competition and improved shop facilities well systematized, but the "Wizard of Menlo Park" has gone to mining iron ore; Brush is vegetating, and Tesla dare not do anything for fear of setting the world on fire by burning up the nitrogen of the atmosphere. The electrical fraternity have had no startling inventions in electrical illumination to wake them from their comatose state for many years.

The National Electric Light Association has exhausted the startling subject of Central Station Bookkeeping, and it is only aroused to enthusiasm by a lecture from Tripler on liquid air, although to be sure a Philadelphian has placed a small opalescent globe around the electric arc, and thereby has cut off a large percentage of the light, but he has been able to save some expense in carbon consumption, and several experimenters have produced weird, ghostly effects in their laboratories by means of vacuum tubes. But we still have with us the alternating and continuous current, of about the same respective amperage and voltage as of yore.

The price of copper has gone up, but the quantity per candle power of illumination for the respective systems remains the same. We juggle with the electric current by means of stationary and rotary transformers and of resistances in about the same old way.

Central station men devote their energies to economizing in oil, labor and the coal pile; our electrical engineers are charging unsophisticated investors large fees, and between times amuse themselves by writing involved, lengthy, abstract, mathematical formulæ, that few except themselves are able to understand.

Our highly educated technical graduates can find nothing to do, unless they have some relative in a "Ten Million Dollar Electric Trust," so they help the poor General Electric Company get rich by working at Schenectady for nothing, filing brass castings, for the sake of experience. The young man cannot get an opportunity, because the old man will not step out.

Everyone and everything seem to be running in a deep rut; originality is at a discount; and inventors are at work on acetylene generators and Welsbach mantles. We are waiting for a Moses to lead us into fresh fields and green pastures; and the province of this article is to indicate the direction of the pilgrimage.

In order to understand what to expect in the future let us look at present methods in an impartial manner from a distant and critical vantage ground.

In ancient times when corn was taken to the mill the grist was

placed in one end of the bag and a stone, as a counter weight, was placed in the other end, and the bag was thrown over the horse's back; and coming from the mill, the flour and the stone were brought home in the same relative positions; by and by a bright boy was sent to the mill who had sense enough not to follow a moss grown tradition, or may be there was no stone at hand; at any rate he divided the grain equally in the two ends of the bag and thus dispensed with the stone.

This innovation made the old methods seem ridiculous and much more so, as a boy and not an engineer or a college professor thought of making the change.

Likewise let us review our present methods of electric illumination in the light of future improvements. Our present systems are sadly lacking in simplicity and cheapness of construction; and in cheapness and efficiency of operation, to such an extent that incandescent gas burners are gradually coming into extensive competition, for exterior as well as interior illumination.

Electricity must soon steal a march on gas or sadly suffer in competition. The methods and vehicles employed by electricians in getting the lighting agent to the lamps are expensive, cumbersome, inefficient and dangerous to life, and are considered bad fire risks. In these respects again gas has the advantage.

So dangerous is the electric wiring of buildings considered, that the rules and regulations of the Fire Underwriters are quite voluminous, intricate and involved, and require lynx-eyed inspectors to interpret as well as to enforce them, and when they have finished along come the municipal inspectors and the fire department representatives with their rules and formulæ to further make the electric contractor's life miserable. No such extensive regulations and inspections occur with common gas or even acetylene.

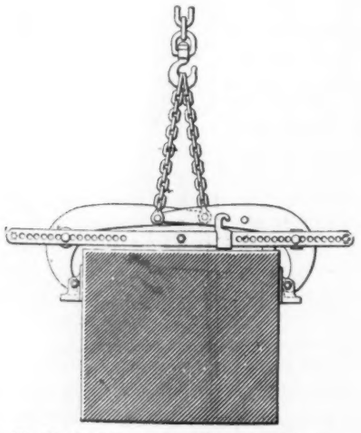
The scope of this article for the present will be confined to lamp burners and the vehicles for feeding them and the paraphernalia connected closely therewith, and the generating plant will be disregarded.

[To be Continued.]

Stone Tongs for Lifting Cut Stone.

Engineering News notes that a new device for setting cut stone has been invented by a Mr. Perdriel, and is described in "Le Genie Civil," from which the following illustration is taken. It is simple, and is claimed to be entirely safe. It is made of two bent levers, sliding horizontally by means of guides, between two bars pierced with holes, so as to adjust the distance between the shoes approximately to the width of the stone to be set by means of two pins inserted in the holes in the bars.

The shoes are hung by a pin joint to the ends of the levers, and as the axis of the supporting pin is above the center of gravity, their



The Perdriel Tongs for Lifting Cut Stone.

faces are always vertical. The faces of the shoes are smooth, but the pressure exerted by them upon the sides of the stone is claimed to be sufficient to prevent slipping. The other ends of the levers are joined by chains to the usual lifting apparatus.

To loosen the grip of the device upon the stone, when the latter is in place, the chain is slacked and two sliding hooks are then moved along the bars until they catch over two pins in the upper part of the bent levers. The pins in the bars can then be pulled out and the levers turned on the new fulcrum, releasing the shoes. The device weighs from 1,650 pounds upwards, according to the size of stone to be lifted.

Moisture in the Air of Rooms Heated by Gas.

By Professor Arche, Vienna, in *Gas World*.

The earlier investigations into the subject of heating by gas were concerned with questions of temperature results, fuel consumptions and cost, as also with the question of contamination of the air by the products of combustion. The effect of heating by gas on the degree of moisture or dryness in the room has not yet been inquired into. The moisture in the air should not fall below 40 or rise above 75 per cent. of complete saturation, else there is discomfort, or even mischief, and therefore a room with damp air needs to be warmed; a room with dry air may need to be cooled.

An Ingenious Test Instrument.—The instrument employed was Lambert's polymeter an ingenious combination of a thermometer with a hair-hygrometer, the hair (human hair) in which lengthens or shortens and works an indicator on a graduated scale. The thermometer has a scale showing for each temperature the corresponding maximum water-vapor pressure in millimetres of mercury. The hygrometer scale enables the percentages of moisture in the air to be read off directly, and there is another corresponding scale which shows how many degrees the temperature must fall in order to bring about a deposit of dew. With this instrument the observer may at once find (1) the temperature of the room, (2) the percentage of moisture in the air, (3) the saturation pressure of water vapor, (4) the maximum quantity of moisture which the air can carry (each millimetre of mercury representing one gramme of water per cubic metre of air=0.437 grain per cubic foot), and (5) the difference between the actual temperature and the dewpoint; and it therefore enables us to find, in addition to the dewpoint, the existing vapor-pressure of water and the existing weight of water in the air. For example, if the room contains 60 cubic metres of air, we may find the temperature to be 16° C.; the corresponding saturation pressure of water vapor is 13 5 mm. of mercury, so that the air in the room, at 13.5 grammes per cubic metre, may contain, as a maximum, $60 \times 13.5 = 810$ grammes of water. Let the percentage of moisture reading be 70, and the corresponding drop of temperature required in order to reach the dewpoint be 5.5° C., then the dewpoint is 10.5° C., nearly. Further, 70 per cent. of a possible 13.5 mm. of water-vapor pressure makes an existing water-vapor pressure of 9.45 mm. mercury, which corresponds to a dewpoint of 10.5 C. Every cubic metre of air actually carries 9.45 grammes of water, or 567 grammes in the room. In such a room the access of moisture readily makes the air too damp, so that there should be both ventilation and warming of the air.

Experiments.—In the following table the data are given throughout a day in rooms, unwarmed, 27th May: Schoolroom, classes in from 9 to 12, schoolroom ventilated 12 to 2; classes 2 to 3 and 4 to 6; doors open after 6 P. M.

Time of Observation.	In the Open Air.			Living Room.			School Room.		
	Temperature °C.	Percentage Moisture.	Dewpoint. °C.	Temperature. °C.	Percentage Moisture.	Dewpoint. °C.	Temperature °C.	Percentage Moisture.	Dewpoint °C.
8 A.M.	12	51	2.3	14	50	4.0	17.0	55.0	8.4
9 "	12	50	2.0	14	50	4.0	18.0	55.0	9.4
10 "	13	50	3.0	15	50	5.0	20.0	64.0	13.5
11 "	13	49	2.7	15	50	5.0	20.5	63.0	13.3
12 noon.	14	47	3.2	16	49	5.7	21.0	66.0	14.9
1 P.M.	16	44	4.2	16	47	5.2	19.0	60.0	11.6
2 "	16	42	3.5	17	47	6.2	18.5	50.0	8.5
3 "	17	43	5.1	17	47	6.2	18.5	55.0	9.9
4 "	16	42	3.5	18	44	6.2	19.0	56.0	10.7
5 "	16	44	4.2	19	44	7.2	19.5	57 5*	11.5
6 "	16	45	4.5	20	44	8.2	19.0	54.0	10.1
7 "	15	45	3.5	19	44	7.2	19.0	52.0	9.5
8 "	15	45	3.5	19	45	7.5	19.0	52.0	9.5
9 "	14	45	2 5	19	45	7.5	18.5	51.0	8.8
10 "	14	47	3.2	19	45	7.5	18.0	51.0	8.3

In the living room the windows were closed till 1 P.M., open from 1 to 3; and in the evening there were lamps lit and persons present.

The following table gives results with the same room on 28th November. The schoolroom was heated (iron stove) from 7 to 12 A.M.; classes 9 to 12 and 4 to 6.

Mere heating is thus proved inadequate to keep the moisture of the air sufficiently high; the air becomes too dry. Evaporation of water is very inconvenient with the stoves used, and the question arose whether the use of a gas stove would not do what was required. In the living room a Siemens gas stove was used; in the schoolroom

Time of Observation.	In the Open Air.			Living Room (Clay Stove.)			School Room (Iron Stove.)		
	Temperature. °C.	Percentage Moisture.	Dewpoint. °C.	Temperature. °C.	Percentage Moisture.	Dewpoint. °C.	Temperature °C.	Percentage Moisture.	Dewpoint °C.
8 A.M.	—1 5	64	—8.3	12.0	55	3.4	10.0	28.0	—7.8
9 "	—1.0	60	—8.4	13.0	54	4.1	13.0	29.0	—4.2
10 "	—1.0	60	—8.4	14.0	53	4.8	15.0	38.0	+1.2
11 "	—0.5	54	—9.4	14.5	53	5.3	18.0	36.0	3.5
12 noon	+2.0	55	—6.6	14.5	54	5.9	19.0	38.0	5.2
1 P.M.	3.0	53	—7.0	15.0	54	6.1	18.5	39.0	5.1
2 "	3.0	52	—6.5	15.0	53	5.8	18.5	35.0	3.7
3 "	2.5	53	—6.7	16.0	52	6.5	17.5	34.0	2.3
4 "	1.0	55	—7.6	16.0	51	6.3	17.0	33.0	1.4
5 "	—0.5	62	—7.5	16.5	50	6.5	17.0	38.0	3.2
6 "	—0.5	59	—8.1	17.0	53	7.8	18.0	39.0	4.6
7 "	—1.0	61	—8.2	16.5	53	7.3	17.0	36.0	2.5
8 "	—1.0	62	—8.0	16.5	53	7.3	16.0	34.5	1.0
9 "	—2.0	64	—8.5	16.0	53	6.8	16.0	33.0	0.4
10 "	—2.0	64	—8.5	16.0	53	6.8	16.0	31.0	—0.5

already referred to a Warstein gas stove was used, with a water evaporator; and in another schoolroom a Siemens gas stove was used, also with a water evaporator. The schoolrooms were heated from 7 to 10 A.M., and the first from 4 to 6 P.M. and the second from 3 to 4; and they were occupied from 8 to 10 A.M. and from 2 to 4. Date, 22nd February, 1899.

Time of Observation.	In the Open Air			Living Room. Siemens Gas Stove.			Schoolroom A. Warstein Gas Stove.			Schoolroom B. Siemens Gas Stove.		
	Temperature °C.	Percentage Moisture.	Dewpoint.	Temperature °C.	Percentage Moisture.	Dewpoint.	Temperature °C.	Percentage Moisture.	Dewpoint.	Temperature °C.	Percentage Moisture.	Dewpoint.
8 A.M.	—4 5	35	—19.5	12.5	75	8 3	14.5	68.5	9.0	15	64	8 5
9 "	—4	35	—18.8	13	73.5	8 5	15	66.5	10.0	15.5	64	9.0
10 "	—4	36	—18 5	14	70	8.8	16	64	9.5	16	62	9.0
11 "	—3	37	—17.1	14 5	69.5	9.2	16	64	9.5	17	62	10.0
12 noon	—1	40	—14.0	14	71	9.0	17	68.5	11.5	18	59 5	10.5
1 P.M.	—1.5	42	—14.0	14.5	69.5	9.2	17.5	64	11.0	18	57.5	10.0
2 "	—1	43	—13.1	15	68	9.4	17	66.5	11.0	17.5	59.5	10.0
3 "	—0.5	45	—12 0	15	71	10.0	16	76	12.0	17	71	12.0
4 "	—1.5	44	—13 3	15 5	68.5	10.0	16.5	76	12.5	18	68	12.4
5 "	—1	43	—13.1	16	71	11.0	16	76	12.0	19	62	12.0
6 "	—2	41	—14.8	16	71	11.0	17	68.5	11.5	18	62	11.0
7 "	—3.5	42	—16.0	16.5	73.5	12.0	17	66.5	11.0	18	62	11.0
8 "	—4	42	—16.5	16.5	73.5	12.0	17	62	10.0	17.5	66.5	11.5
9 "	—5	41	—17.8	17	76	13 0	16.5	64	10.0	17.5	59.5	10.0
10 "	—5	43	—17.1	17	71	12 0	16	62	9.0	17.5	57.5	9.5

The external air was very dry on the day chosen for the tests, but in the living room and in the more unmanageable schoolrooms the moisture, and the dewpoint were kept within perfectly satisfactory limits; and a comparison of the last table with the one preceding it will show what a marked improvement had been produced, even though the building had not yet become seasoned to the new method. Watching the instrument enables the required conditions to be readily commanded, by controlling the working of the gas stove, which is a very great convenience as compared with the use of solid fuel.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. JAMES A. FOSTER has been appointed Superintendent of the Joplin City (Mo.) Light and Fuel Company.

A CORRESPONDENT forwards ths following from Kansas City, Mo., under date of December 31st: "The Kansas City, Missouri, Gas Company was organized April 1, 1897, taking over to it at that time the properties of the Kansas City Gas Company and the Missouri Gas Company, and has continued the liberal policy then in force. Since that time the Company has secured a steady increase in business, and now has over 19,000 meters in use, a record which will bear comparison with older and larger cities. The 2 per cent. paid to the city on gross receipts from sales of gas amounts to over $14,000 for the current year. The requirements, as to candle power and quality of gas furnished the city and consumers, have been exceeded, as shown by the records of the City Gas Inspector's office. During the year the Company extended its mains to cover new territory and reach new business, a distance of 57,280 feet (or something over ten miles), has run 1,050 new house connections, set up 174 new city lamps and lamp posts, and made improvements and betterments at the works to cope with the steadily increasing demand for gas for lighting and fuel purposes. There are now nearly 17,000 gas ranges and appliances loaned to consumers—a gain of over 1,000 for the year. For 1900 many extensions and improvements are under consideration involving an expendure of $75,000 to $100,000. The Company may be depended upon to contribute its share towards making and keeping Kansas City a good place to live and do business in."

MR. H. W. REILLY has been appointed Superintendent of the Salisbury (N. C.) Gas and Electric Light Company.

AT a special meeting of the Directors of the Portsmouth (N. H.) Gas, Electric Light and Power Company Mr. Hiram B. Lord was elected Treasurer and Clerk of the Company, vice Mr. Horace W. Waldron, when resignation was reported in the JOURNAL for December 25th last.

THE Clyde (N. Y.) Gas and Electric Light Company is again in trouble, its plant having been seized by the sheriff, under judgments secured by Syracuse creditors. At the instance of the stockholders Mr. Justice Dunwell has issued an order to show cause why the corporation should not be dissolved. The value of the plant is returned at $71,344, and the liabilities are placed at $50,279.

THE project for the establishment of a gas works in Dover, N. J., is again being agitated. There is no doubt that such a plant could be there profitably operated.

MR. JENKINS, of Wisconsin, has introduced a bill in the House of Representatives, Washington, which seeks to put the selling rate for gas in the District of Columbia at 75 cents per 1,000 cubic feet, and which directs that the Washington and Georgetown Gas Light Companies shall pay a tax of one-half their profits in excess of 6 per cent. per annum on their paid up capital stock.

AT the annual meeting of the Peekskill (N. Y.) Gas Light Company these officers were chosen: Directors, William M. Crane and George H. Warner, of New York; and Stephen Lent and D. E. Herrick, of Peekskill; President, William M. Crane; Vice-President, George H. Warner; Treasurer and Secretary, Stephen Lent.

AT a meeting of the Board of Directors of the Wilmington (N. C.) Gas and Electric Company, the reorganization of the Company was completed. Four of the former Directors resigned. Their places were filled by the election of Mr. W. W. Randolph, of New York, and Messrs. M. J. Heyer, Hugh McRae and Junius Davis, of Wilmington. The other Directors are: Messrs. E. S. Martin, G. R. French and G. Herbert Smith. We understand that the plant will be overhauled.

WE are told that the proposed gas works for Shelby, Ohio, are assured. It would seem quite in line with the assertion, when that it is backed up by the statement that 350 of the residents of Shelby have signed contracts to take gas from the Company when its works shall have been completed.

AT the annual meeting of the Lebanon (Pa.) Gas Company the Directors chosen were: Anthony Aurentz, Rudolph Beam, H. C. Grittinger, J. P. S. Gobin, Chas. H. Killinger, John W. Mish and L. E. Weimer. The following executive organization was named by the Directors: President, L. E. Weimer; Treasurer and Secretary, John W. Mish. A semi-annual dividend of 4 per cent. was declared. The Company's affairs are in flourishing condition, and Manager Mish (for such he is, in addition to his cares as Treasurer and Secretary) is as much of a believer in the Company's expansive future as he was when he first entered its service a great many years ago.

THE wideawake management of the Hackensack (N. J.) Gas and Electric Company are disposed to extend their gas mains to and through the borough of Fairview.

AT the annual meeting of the Chambersburg (Pa.) Gas Company the officers chosen were: Directors, S. M. Linn, A. Duncan, T. McDowell, F. Lindsy, Isaac Stine, W. U. Brener and M. C. Kennedy; President, S. M. Linn; Treasurer and Secretary, Hastings Gehr.

THE proprietors of the Jamaica Plain (Mass.) Gas Company announce a reduction in the selling rates to $1.20, gross, per 1,000, and $1 net, as against $1.45 gross, and $1.25 net. The concession dates from the 1st inst.

A CORRESPONDENT in Meriden, Conn., writing under date of January 5th, says: "Mr. Julius Pinney, one of the best known men in Stafford, Conn., died there the afternoon of December 30th. He was born in Staffordville, October 9, 1845. His first business venture was in connection with R. F. Eaton, under the firm name of Eaton & Pinney, in conducting a general store in Stafford. While a member of that firm he served a term as representative in the Connecticut Legislature. In 1872 he went to South Manchester and engaged in mercantile trading, having as a partner Mr. Wm. H. Cheney. He subsequently conducted the Willimantic Company's store in Willimantic. During his stay in Willimantic he organized the Citizens Gas Light Company, and retained an interest therein for several years. He was a warden of Willimantic borough in 1892. Of late years he had not been actively engaged in business. He had been ill for several months."

THE Riter-Conley Manufacturing Company has been awarded a contract by the Milwaukee (Wis.) Gas Light Company for the construction of a 4-lift holder, to have a capacity of 3,000,000 cubic feet. It is to rest in a steel tank, the diameter of which is to be 184 feet. The same constructors are now building a 1,000,000 cu. ft. holder for the United Coke and Gas Company, Sydney, Nova Scotia.

THE West Side Gas Company and the West Side Electric Light Compano, of Wilkes-Barre, Pa., have amalgamated their properties and interests. Bonds in the sum of $175,000 are to be issued.

PAPERS announcing the incorporation of the Niagara Falls (N. Y.) Gas and Electric Light Company have been filed. It is capitalized in $100,000, and its Directors are: Harry Highland, Amasa A. Oatman and Elizabeth Read, of Niagara Falls; Lester H. Humphrey, of Warsaw, N. Y.; David W. McNair, New York city, and Walter D. Ingham, Buffalo.

SENATOR OLIN BRYAN, of Baltimore, Md., has introduced a bill in the Maryland Legislature, which directs that the selling price of gas in Baltimore shall not exceed $1 per 1,000 cubic feet; the ruling rate is $1.25 per 1,000. The full text of the Bryan "push" is as follows: "A bill entitled "An act to repeal Section 461 of Article IV., public local laws, entitled 'City of Baltimore,' sub-title 'Gas Companies,' as amended, and re-enacted by Chapter 123 of the acts of 1898, and to re-enact the same with amendment.

"Section 1. Be it enacted by the General Assembly of Maryland, that Section 461 of Article IV., public local laws, entitled 'City of Baltimore,' sub-title 'Gas Companies,' as amended and re-enacted by Chapter 123 of the Acts of 1898 be repeated and re-enacted so as to read as follows:

"461. No corporation or person shall charge for illuminating gas in Baltimore city a sum to exceed $1 per 1,000 cubic feet."

MR. F. H. SHELTON, writing from Philadelphia, under date of the 9th inst., says:

To the Editors AMERICAN GAS LIGHT JOURNAL: At the last meeting of the Western Gas Association I wrote, you will recall, a paper advocating the distributing of gas at high pressure, instead of laying several miles of large mains at enormous expense to connect nearby communities. I have not been afraid to take my own medicine, as is evidenced by the fact that within the last 90 days I have completed a pipe line 4½ miles long, by which gas made at Phœnixville, Pa., is carried to Royersford and Spring City, feeding that city of 6,000 or 7,000 people. The pipe line is 3-inch, screw pipe, laid with exceptional care. A compressor pumps the gas at 15 to 25 pounds pressure, and suitable regulators at the far end reduce it to the normal. The equipment has been finished and is fulfilling my entire expectations. Everything works excellently. There is no perceptible loss of candle power, and no apparent reason exists that its operation should not continue indefinitely satisfactorily. While the Pintsch people have pumped a pure oil gas at a high pressure in many instances, and Mr. Edgerton, at Danbury, Conn., has pumped a semi-oil, semi-water gas about 3 miles for some years with entire success, the Phœnixville equipment is the first installation in the United States of its kind in which an ordinary, everyday water gas is being pumped nearly 5 miles at 20 pounds pressure or thereabouts. I am more firmly of the belief than ever that the future will see such installations very generally used, as the construction account is vastly less than when the old arrangement is put in. I have not heretofore been aware of ordinary gas being pumped at higher pressure than 2 pounds. It is likely that I will give a brief description of the installation before the meeting of the New England Association of Gas Engineers in February next, and its further workings to that date.

The following is the text of the act under which it is proposed to engage the city of Buffalo, N. Y., in the operating and maintaining on public account of a lighting plant:

Section 1. The City of Buffalo is hereby authorized and empowered to light the streets and public and private buildings, and places of said city, and for that purpose to purchase the necessary property, real and personal; to erect, construct and maintain the necessary lighting plant or plants, with their appurtenances, and the necessary wires, pipes, conduits and other means of distribution as may be necessary, with their appurtenances. And for the purpose of carrying out the object of this act, the said city is also authorized and empowered to take such lands as may be necessary by right of eminent domain in the manner provided by title 20 of Chapter 125 of the laws of 1891, the same being the charter of the said city.

Section 2. Said City of Buffalo is further authorized and empowered, for the purpose of carrying out the objects of this act, to issue the bonds of the city in the sum of $2,500,000, such bonds to bear interest at a rate not exceeding 3½ per centum per annum, payable semi-annually at the office of the Comptroller of the City of Buffalo or at the Gallatin National Bank, in the City of New York, as the purchaser may elect, the principal to be payable at the same place, one-twentieth thereof to be payable at the end of each successive year thereafter until the whole sum shall have been paid. Such bonds shall be issued from time to time, as may be ordered by the Common Council, by the Mayor and Comptroller under the city seal, and shall be sold or awarded as provided in Section 492 of Chapter 105 of the laws of 1891. The Common Council shall make provision for the payment of interest on and the principal of said bonds as the same shall become due in the general fund estimates for said city.

Section 3. The city may charge for light furnished to private individuals and corporations such sum as the Common Council shall fix.

Section 4. This act shall take effect immediately.

AT the annual meeting of the shareholders in the St. Albans (Vt.) Gas Light Company the Directors chosen were: Samuel T. Bodine, Randal Morgan, Edward C. Lee, H. H. Piggott and Marshall Mason.

MR. EDWARD C. DELANEY, for some years Superintendent of Works of the Rochester (N. Y.) Gas and Electric Company, died at his home in that city, Tuesday, December 26. Deceased, who was born in Rochester 48 years ago, was a man of much character, and had been engaged in the gas business in Rochester since 1872, in which year he served the Municipal Gas Company. Later on he went to the Citizens Gas Company—speculation in gas was rampant in Rochester in the late seventies—and when the gas wars were concluded by a peace merger, Mr. Delaney was appointed Superintendent of Works in the consolidated concern. Mr. W. L. Cole, Secretary of the Company, in speaking to a reporter for the Rochester *Express* as to the worth of the dead man, said: "Mr. Delaney was almost invaluable to the Company on account of his wide experience. I suppose he knew more about the actual making of gas than any other man in Rochester. He had made a study of the different methods of gas making, and, having grown up in the business, he knew it thoroughly."

AT the annual meeting of the New Haven (Conn.) Gas Light Company the Directors chosen were: Chas. R. Ingersoll, George J. Brush, Francis Wayland, Andrew W. DeForest, E. Hayes Trowbridge, Pierce N. Welch, George D. Watrous, Robert A. Brown and T. Atwater Barnes. In respect of recapitalizing the Company, this resolution was adopted: "*Voted*, that the Board of Directors be, and it hereby is, authorized to increase the capital stock of the Company, by the issuance, from time to time, of such amount of new stock as may in its judgment be expedient and for the best interests of the Company; provided that the total amount of such new stock shall not exceed 40,000 shares of the par value of $25 each, and that such new stock may be subscribed for by the stockholders in proportion to their holdings; this increase being in accordance with a joint resolution of the General Assembly of this State, passed at its May Session, A. D. 1874." This voting evidently means that the shareholders of the Company are to have in due time all that is coming to them from the careful management of their executive representatives. At a subsequent meeting of the Directors the following executive organization was perfected: President, Andrew W. DeForest; Vice-President, Pierce N. Welch; Treasurer, Isaac J. Wild; Secretary, Gardner Morse; Supt., F. C. Sherman.

AT the annual meeting of the shareholders in the Omaha (Neb.) Gas Company the Directors elected were: Randal Morgan, Frank Murphy, George E. Barker, C. B. Woods and Samuel T. Bodine. The Directors selected the following officers: President, Frank Murphy; Vice-President, George E. Barker; Treasurer, Isaac Battin; Secretary, G. W. Clabaugh; Superintendent, Isaac N. Knapp.

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MONDAY, JAN. 15, 1900.

The Market for Gas Securities.

The market for city gas shares showed no particular change during the week, which was rather surprising, in that every development from a business point of view favored round advances in all the local shares save New Amsterdams. Mr. Sage's admission that he had sold his stock in the Standard Company, of course, should not be much of a surprise, for a good many people in this section think he parted with it when Mr. John T. Terry parted with most of his. However, as Mr. Terry himself would say, "that is a matter of detail."

The situation here is all in favor of share owners, and the make up of the New York legislative committees (the Committee on Miscellaneous Incorporations in the Senate and the Committee on Gas, Water and Electricity in the Assembly) should be reassuring to those who believe that the proposed works of the Astoria Company will be eventually built.

Nominally, local shares are all weaker, save in the instance of Brooklyn Union. This latter fact is queer, keeping in mind that Senator Coffey is said to be urging a bill putting the gas rate in Brooklyn at 75 cents per 1,000. His bill will not pass; for he does not mean that it shall. Baltimore gas has been affected some by the proposition to cut the rate to $1, a bill for which end is now in the Legislature. Like as was said in the Coffey instance, so may it be said regarding Baltimore. The general situation would seem to favor the investor.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JAN. 15.

☞ All communications will receive particular attention

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$39,078,000	100	190¼	..
Central Union, Bonds, 5's.	3,000,000	1,000	107⅛	108⅛
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	115	18
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	300	305
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
New Amsterdam Gas Co.	13,000,000	100	22	23
Preferred	10,000,000	100	44	47
Bonds, 5's	11,000,000	1,000	94	95
Northern Union, Bonds, 5's.	1,250,000	1,000	95	97
New York and East River, Bonds 1st 5's	3,500,000	1,000	109	111
" 1st Con. 5's	1,500,000	..	112	114
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	100	105
Preferred	5,000,000	100	125	..
Bonds, 1st Mortgage, 5's	1,500,000	1,000	110	114
Yonkers	299,65	500	130	.
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	145	145¼
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	1⅛	1⅜
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works.	450,000	100	40	..
" 1st Mtg. 5's	475,000	1,000	96⅛	99½
Boston United Gas Co.— 1s Series S. F. Trust	7,000,000	1,000	92	..
2d " " "	3,000,000	1,000	68	71
Buffalo City Gas Co.	5,500,000	100	9	11
" " Bonds, 5's	5,250,000	1,000	84	85
Central, San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,207,000	1,000	106	108
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	60	65
Preferred	3,026,500	100	84	86
Consumers, Jersey City Bonds	600,000	1,000	102	105
Cincinnati G. & C. Co.	8,500,000	100	193⅛	194⅛
Consumers, Toronto	1,700,000	50	230	235
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	11,000,000	100	53	..
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	21	23
" Con. Mtg. 5's	380,000	1,000	87	90
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,560,000	50	95¼	96
" Prior Lien 5's	4,598,000	1,000	99¼	100
Detroit Gas Co., 5's	386,000	1,000	100	101
" Inc. 5's	16,000	100	100⅛	101
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	77	83
" Bonds	2,000,000	..	80	85
Grand Rapids Gas Lt. Co.	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	..
Hartford	750,000	25	..	220
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	102	105
Indianapolis	2,000,000	..	132	138
" Bonds, 6's	2 650,000	..	105	106
Jackson Gas Co	250,000	50	72	73
" 1st Mtg. 5's	250,000	1,000	101	102½
Lafayette Gas Co., Ind.	1,000,000	100	68	70
Bonds	1,000,000	1,000	81	86
Louisville	2,570,000	50	106	
Laclede, St. Louis	7,500,000	100	78¼	79
Preferred	2,500,000	100	96	97
Bonds	10,000,000	1,000	107	

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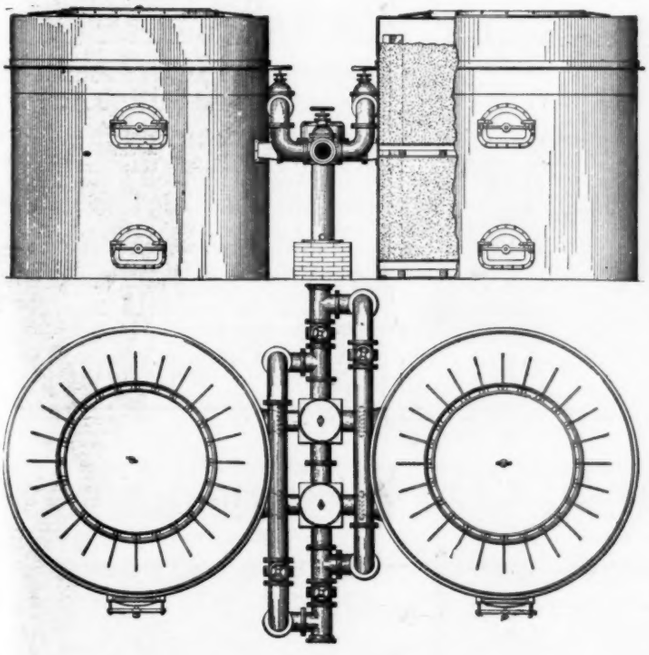

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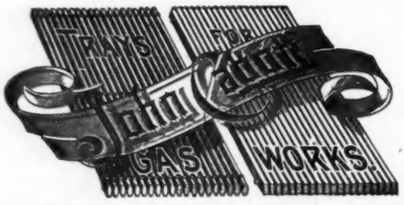

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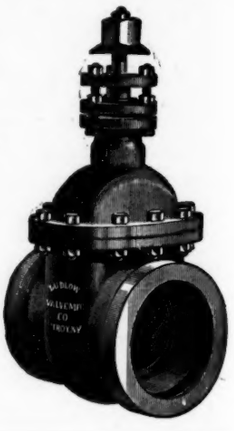

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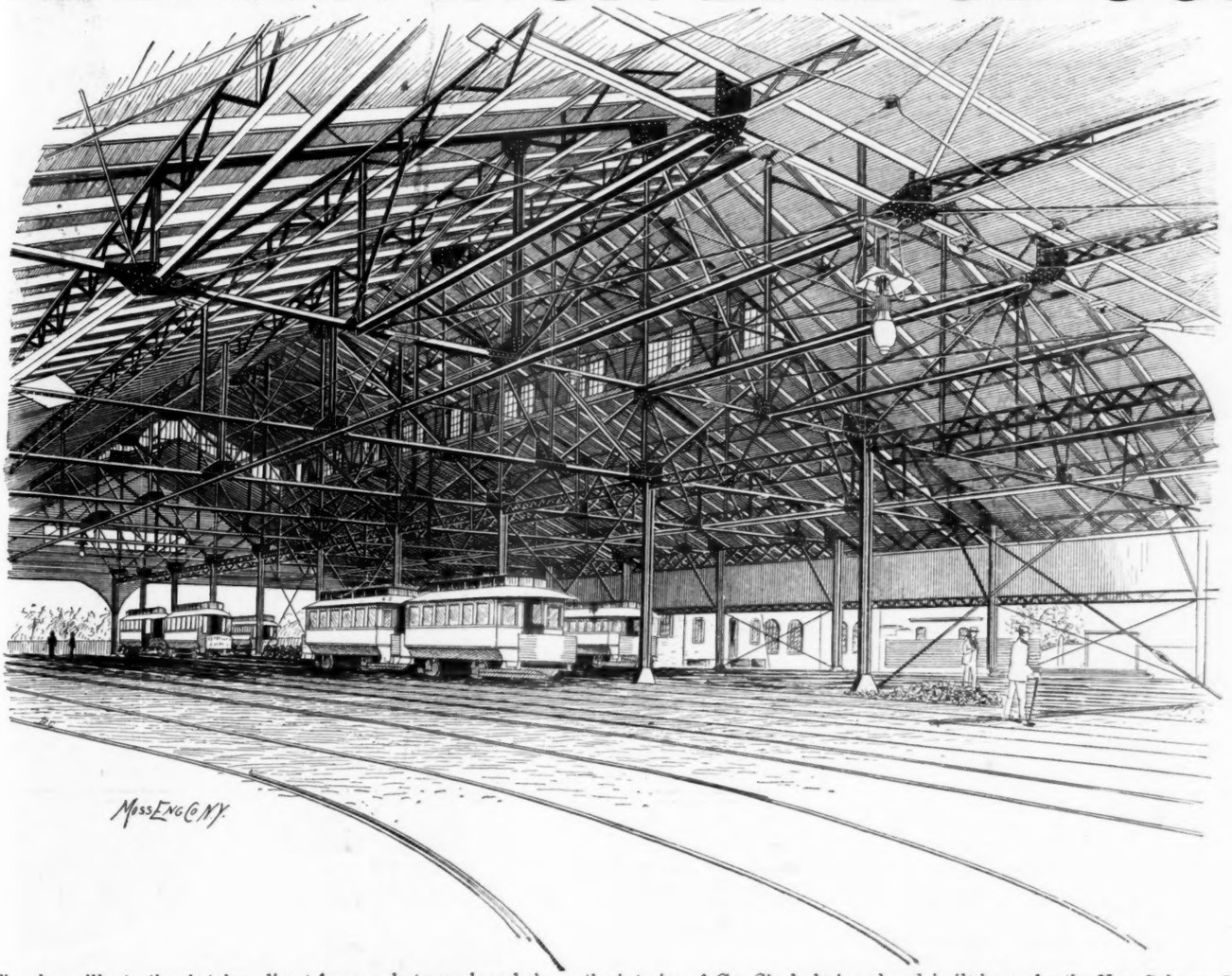

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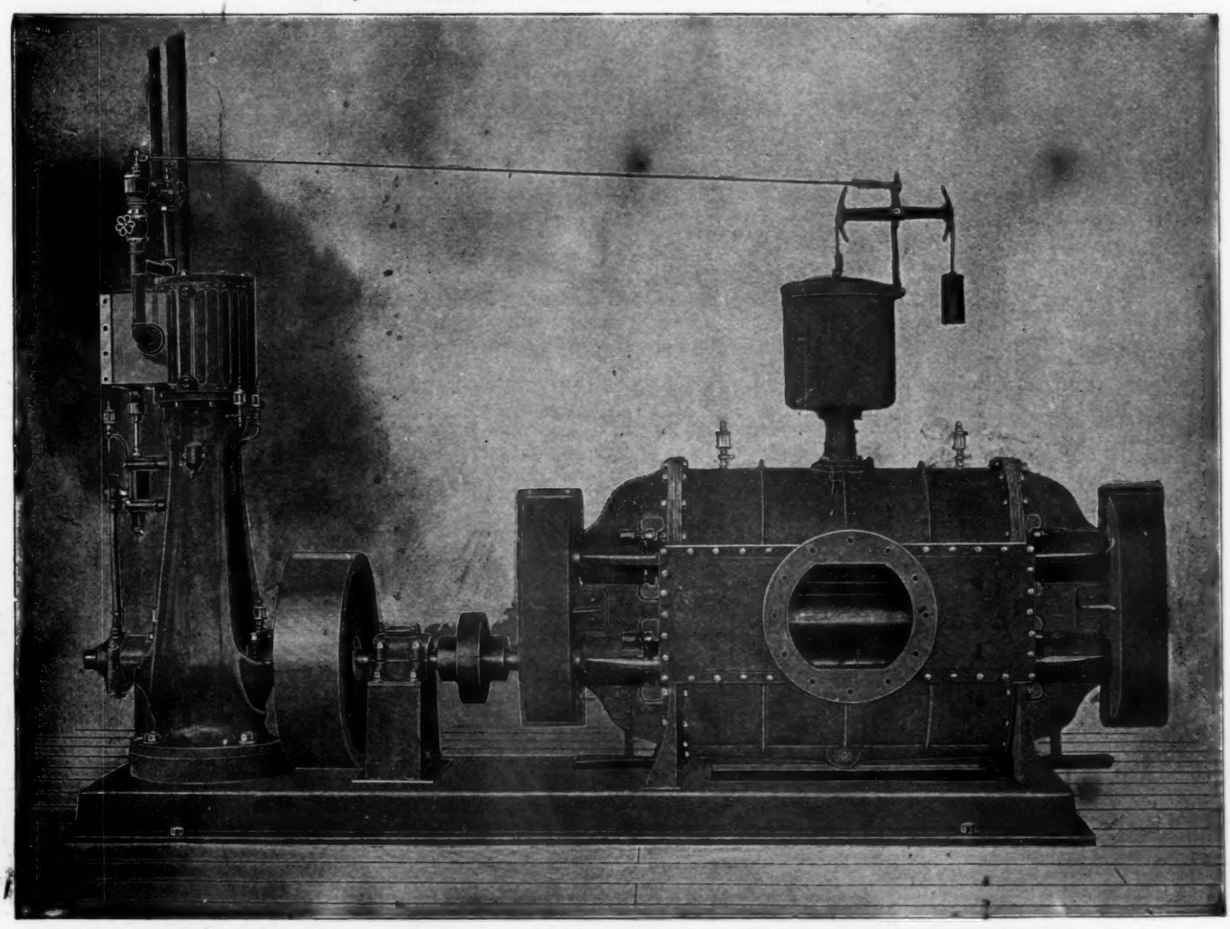

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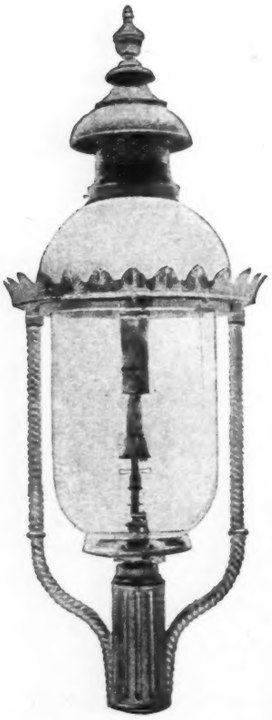

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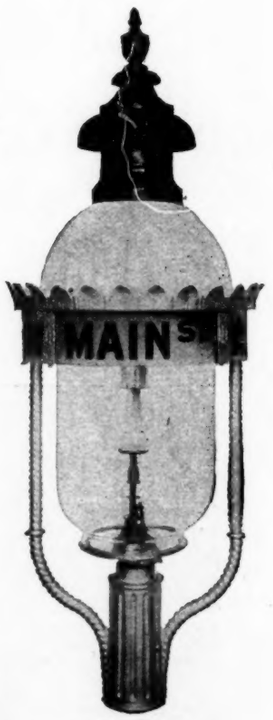

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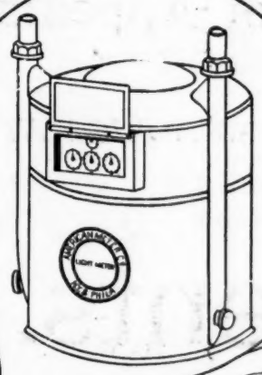
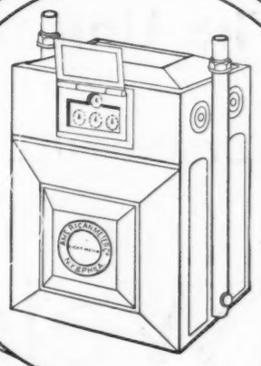
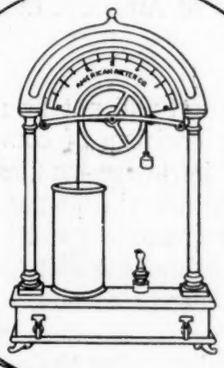


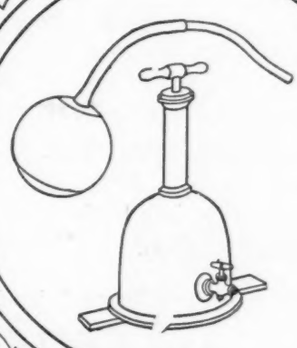


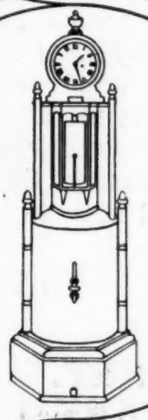


PUBLIC LIGHTING TABLE.

FEBRUARY, 1900.

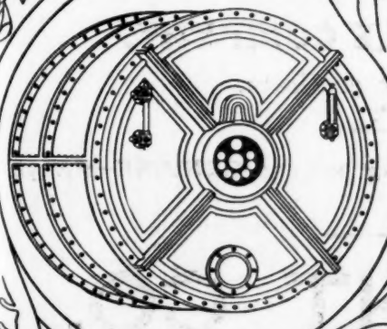
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Thu.	1	5.50 PM	6.10 AM	5.05	6.15
Fri.	2	5.50	6.10	5.05	6.15
Sat.	3	5.50	6.10	5.05	6.15
Sun.	4	10.20	6.00	5.05	6.15
Mon.	5	11 30	6.00	5.10	6.10
Tue.	6	12.40 FM	6.00	5.10	6.10
Wed.	7	1.40	6.00	5.10	6.10
Thu.	8	2.30	6.00	5.10	6.10
Fri.	9	3.20	6.00	5.10	6.10
Sat.	10	4.00	6.00	5.10	6.10
Sun.	11	4.40	6.00	5.10	6.10
Mon.	12	5.10	6.00	5.20	5.55
Tue.	13	No L.	No L.	5.20	5.55
Wed.	14	No L. FM	No L.	5.20	5.55
Thu.	15	No L.	No L.	5.20	5.55
Fri.	16	6.10 PM	9.00 PM	5.20	5.55
Sat.	17	6.10	9.50	5.20	5.55
Sun.	18	6.10	10.50	5.20	5.55
Mon.	19	6.10	11.50	5.30	5.55
Tue.	20	6.10	12.50 AM	5.30	5.55
Wed.	21	6.10	1.50	5.30	5.55
Thu.	22	6.10 LQ	2.50	5.30	5.55
Fri.	23	6.10	3.40	5.30	5.55
Sat.	24	6.10	4.40	5.30	5.55
Sun.	25	6.20	5.30	5.30	5.55
Mon.	26	6.20	5.30	5.30	5.45
Tue.	27	6.20	5.30	5.30	5.45
Wed.	28	6.20 NM	5.30	5.30	5.45

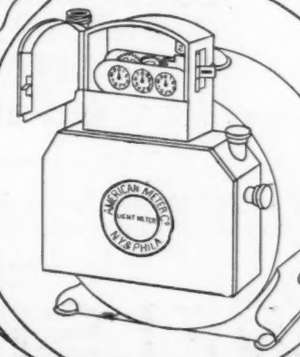




TOTAL HOURS LIGHTING DURING 1900.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	230.50	January	423.20
February	175.40	February	355.25
March	189.00	March	355.35
April	160.30	April	298.50
May	150.40	May	264.50
June	137.00	June	234.25
July	152.00	July	243.45
August	171.50	August	280.25
September	187.20	September	321.15
October	213.10	October	374.30
November	221.50	November	401.40
December	231.50	December	433.45
Total, yr.	2221.40	Total, yr.	3987.45





THE RECENT DECISION.

The United States Circuit Court of Appeals,

In Its Opinion of December 7, 1899,

FINALLY AND FULLY SUSTAINS THE WELSBACH COMPANY'S PATENT.

DEALERS and USERS and MANUFACTURERS are CAUTIONED against INFRINGEMENT of the

Welsbach Patents.

Judge LACOMBE, in the United States Circuit Court, handed down the following opinion Saturday, Dec. 9, 1899.

On motion to restrain complainant from sending circulars to the customers of American Incandescent Lamp Company.

LACOMBE, Circuit Judge.

Irrespective entirely of the preliminary objection that affirmative relief of this sort will not be granted to defendant—a question not now passed upon—there seem no good grounds for criticism of complainant's circular. It states that Judge Townsend enjoined the "manufacture and sale" of infringing mantles, and he did grant such an injunction. And this Court has enjoined the sale of mantles which the person enjoined did not himself manufacture, when his past conduct in the matter of infringement created a special equity in favor of the complainant against him. It is true that the circular goes further, and threatens suit against persons who sell mantles, but who never have been at all concerned in manufacturing or causing them to be manufactured.

In other words, it threatens suit upon the patent as if it were a patent for a product. But the complainant insists that the threat is made in good faith; that it intends to bring suits against sellers of the infringing mantles upon the theory that the patent is really one for a product. In view of the peculiar language of the claim, this Court is not now prepared to hold that such contention would be wholly without merit, or that the complainant could not succeed against a mere seller. Moreover, it is contended that the seller of a purchased mantle himself promotes the taking of the final step in the process, and such contention has not yet been passed upon adversely to complainant. These are questions which should be left to be determined in one of such suits, rather than here. If complainant intends to prosecute one or more sellers, and there is nothing before the Court to induce a disbelief in its assertion that it does so intend, it would seem to be its proper course to warn dealers to desist from selling.

December 9, 1899.

Restraining orders issued in the United States Circuit Courts against—

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ST. LOUIS INCANDESCENT MANTLE COMPANY.
ECKERLE ELECTRICAL COMPANY.
H. KUPFER.
THE NEWBY INCANDESCENT MANTLE COMPANY.

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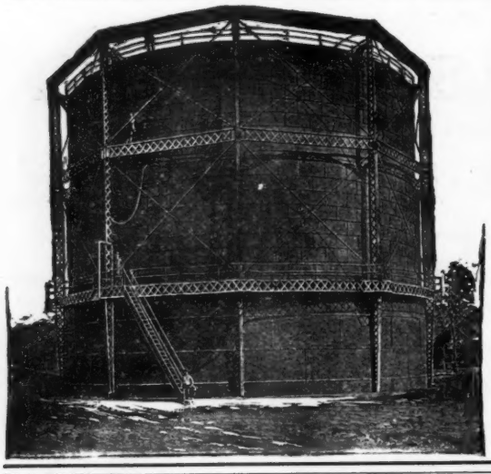

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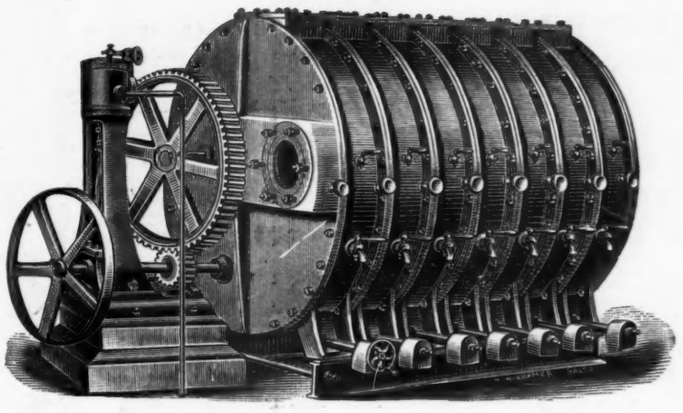

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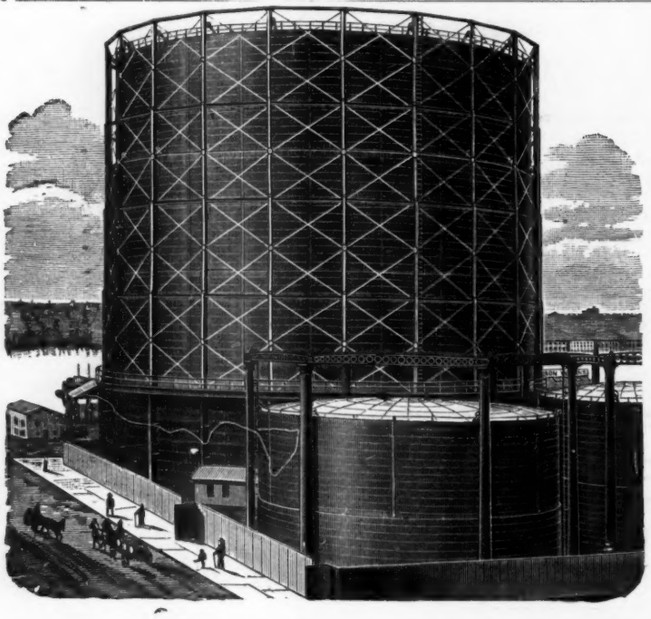

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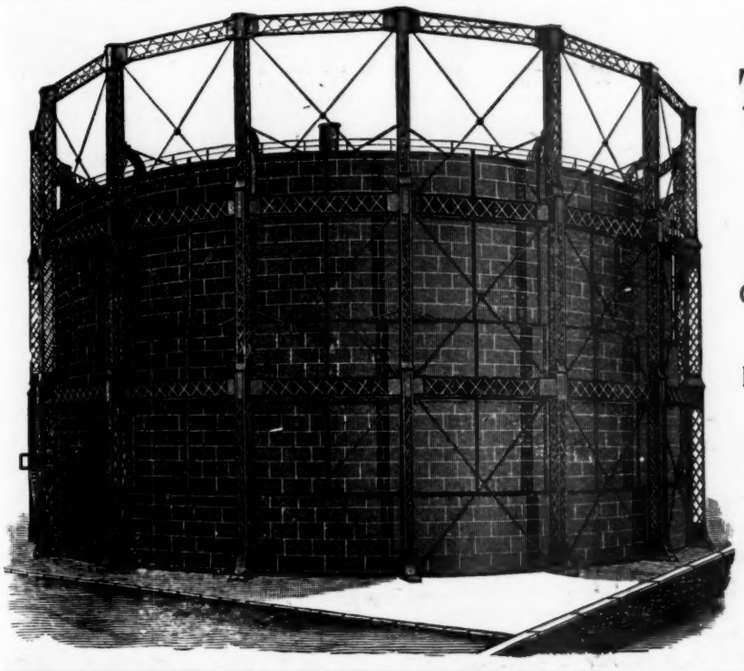

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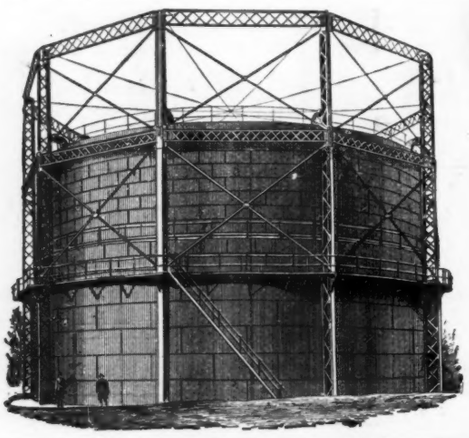

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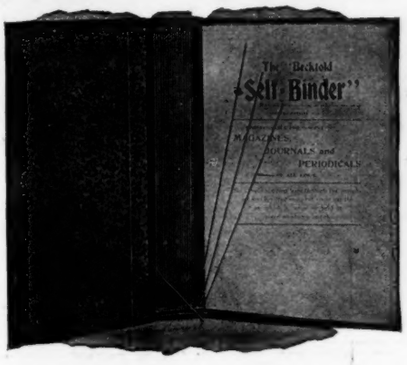

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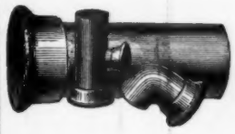

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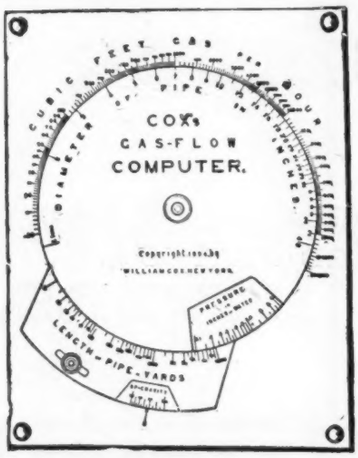

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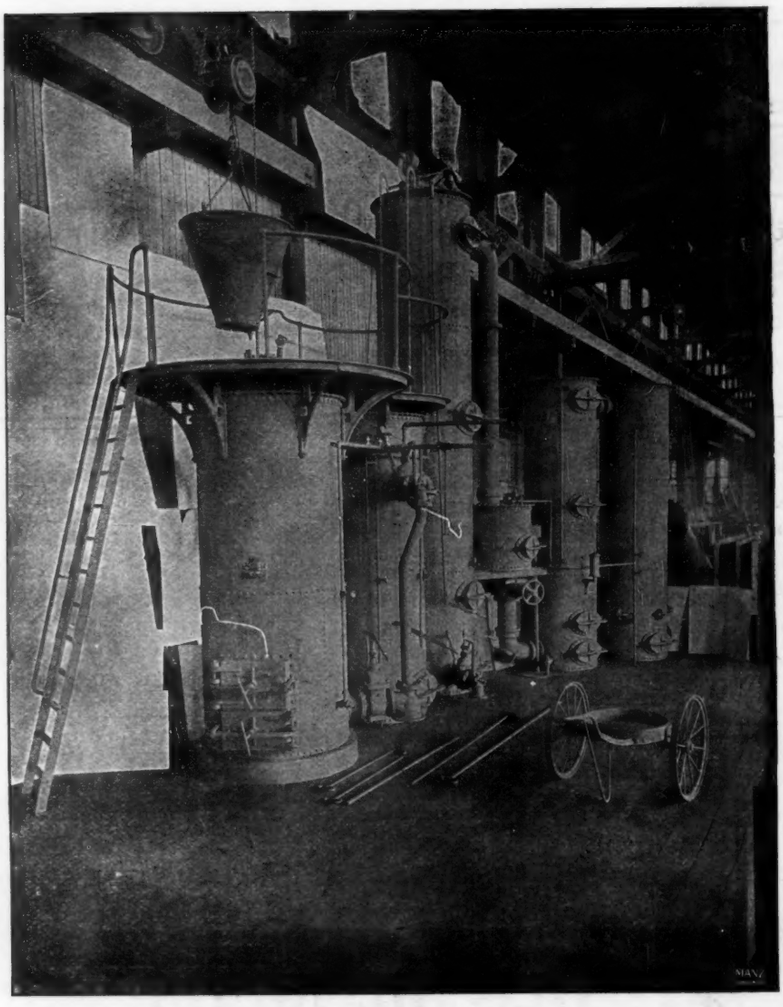
WHEN A GAS MAN KNOWS

THAT HIS

This is not special—it happens to all, only the others haven't the honor of appearing in the JOURNAL.



If you elsewhere see this style of AUTOMATIC FUEL CHARGING DEVICE;
If you elsewhere see this style of DOUBLE SUPER-HEATER PLATFORM APPARATUS;
REMEMBER, it has been COPIED BODILY FROM US.

IMPROVED LOWE WATER GAS APPARATUS

Is **completely put together** in our shop before shipment, being only dismantled sufficiently for transportation, **he has an assurance,** not otherwise possible, that when it is re-erected in his works **it will fit, and Look to Fit, and, most important, IS FIT.**

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EASTERN ENGINEER,
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The Western Gas Construction Co.,
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